Simultaneous Subtraction of MWD and SRME

NZ 3D Processing

03 February 2021

INSTITUTE FOR GEOPHYSICS

CGG
Passion for Geoscience

cgg.com

Processing flow

1. Convert to CGG internal format
2. Nav merge / trace edit
3. Low cut filter
4. Time Variant Scaling (TVS) & Resample to 4ms
5. Swell noise attenuation (SNA)
6. Debubble
7. Linear noise attenuation (LNA)
8. Tidal statics correction
9. Water column statics correction
10. Shot & channel scaling
11. Receiver motion correction (RMC)
12. Joint Deghost & Designature
13. Residual Bubble Removal
14. Source Sensor Datum Correction
15. Shallow Water Demultiple
16. Surface Related Multiple Elimination (3D SRME)
17. Simultaneous Subtraction of MWD & SRME

© 2020 CGG

Outline

- **Objective:**

  To remove free surface related multiple.

- **Procedure:**

  Subtract MWD & SRME models from input seismic to achieve multiple free seismic data.

- **Display:**

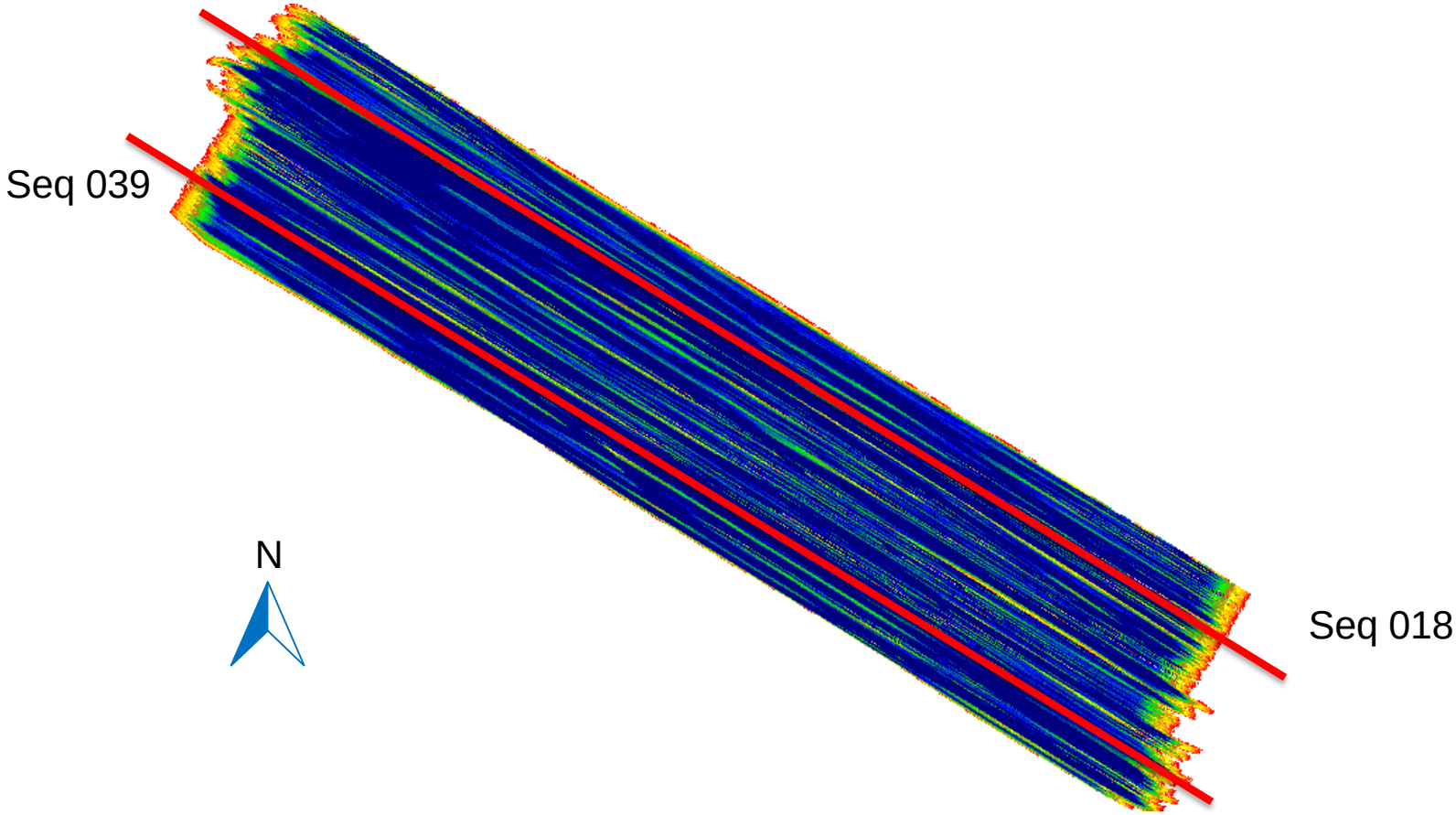
  Sailline 018, 039
  Display: Stack, common channel and shot gathers.(Input; SRME Subtraction; SRME & MWD Subtraction; Difference from input; SRME & MWD Model)

- **Observation and Recommendation:**

  Simultaneous subtraction with both MWD & SRME models shows benefit in multiple removal and primary protection. It’s recommended to apply for production.

© 2020 CGG

Test Line Location



© 2020 CGG

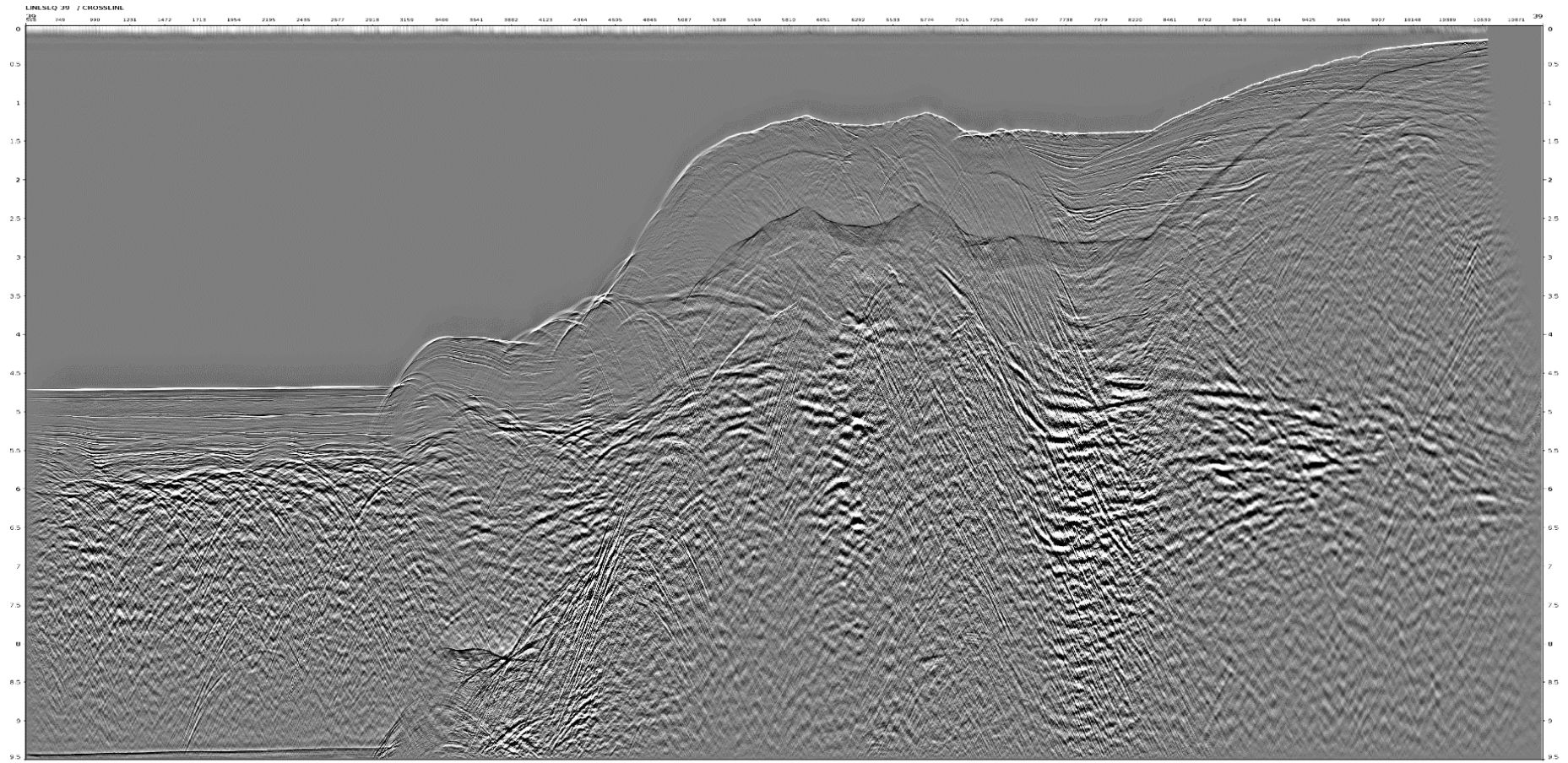
Seq 039

Stack

Common Channel

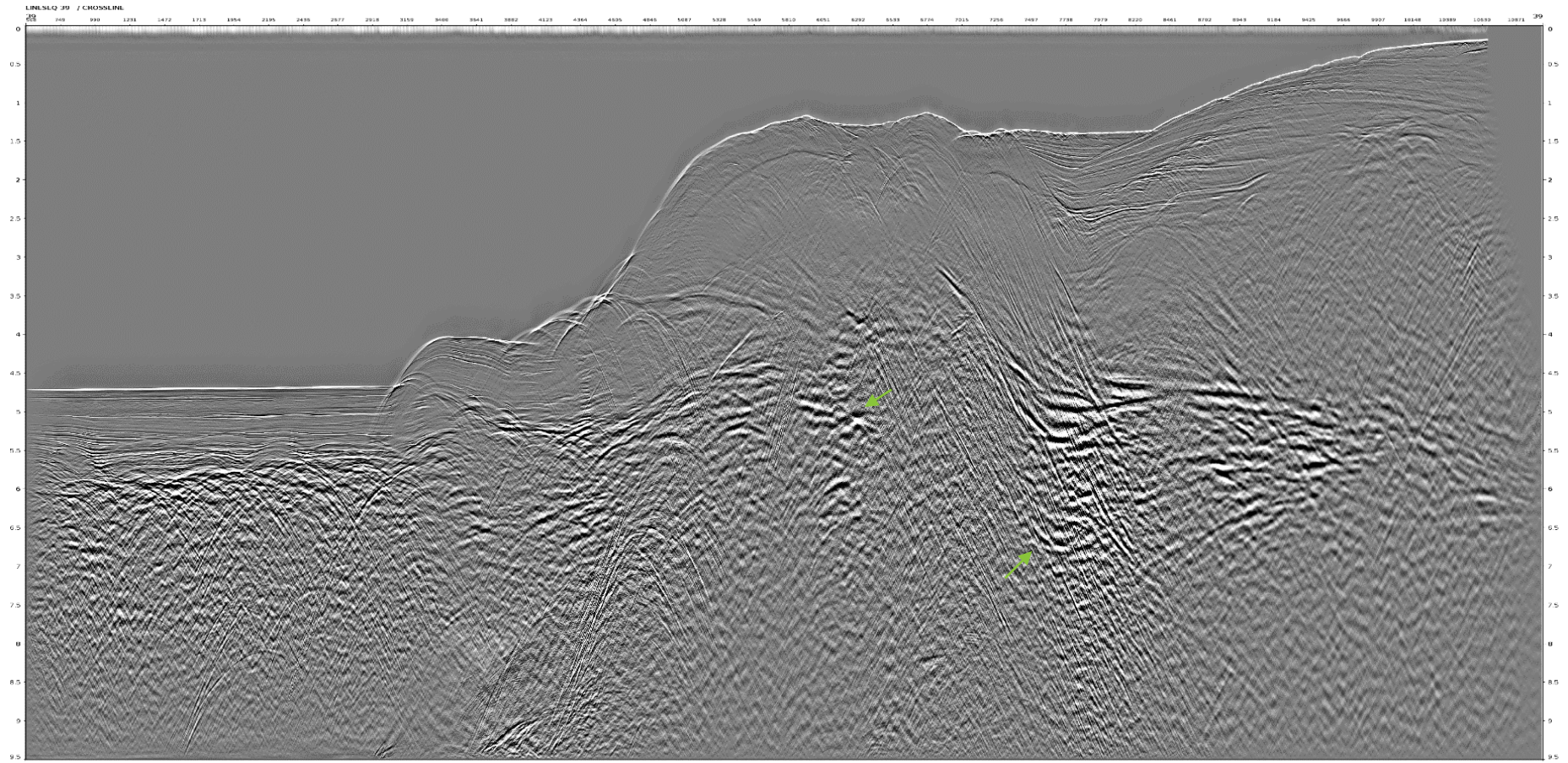
Shot Gathers

Stack before Subtraction



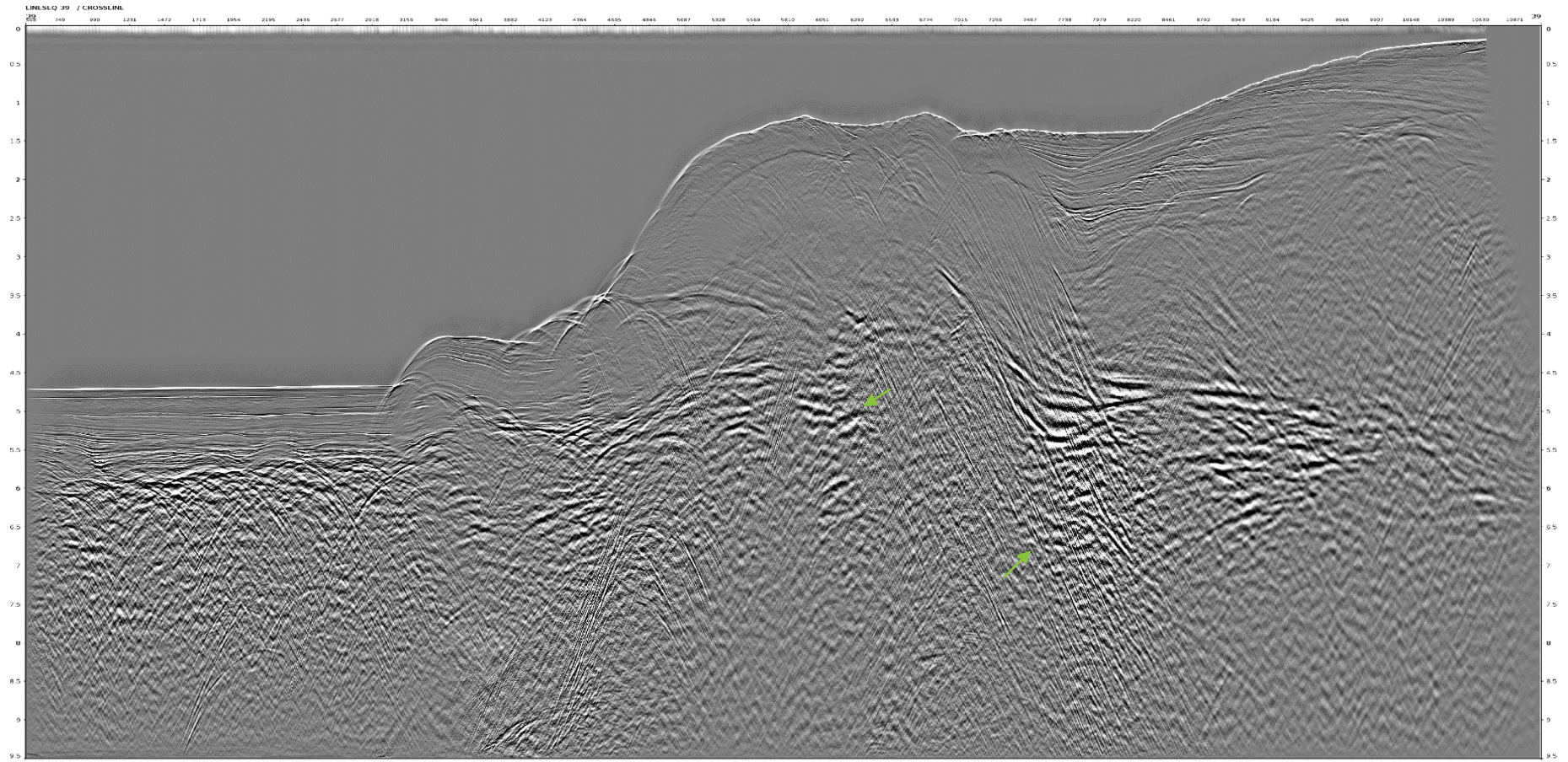
© 2020 CGG

Stack after SRME Subtraction



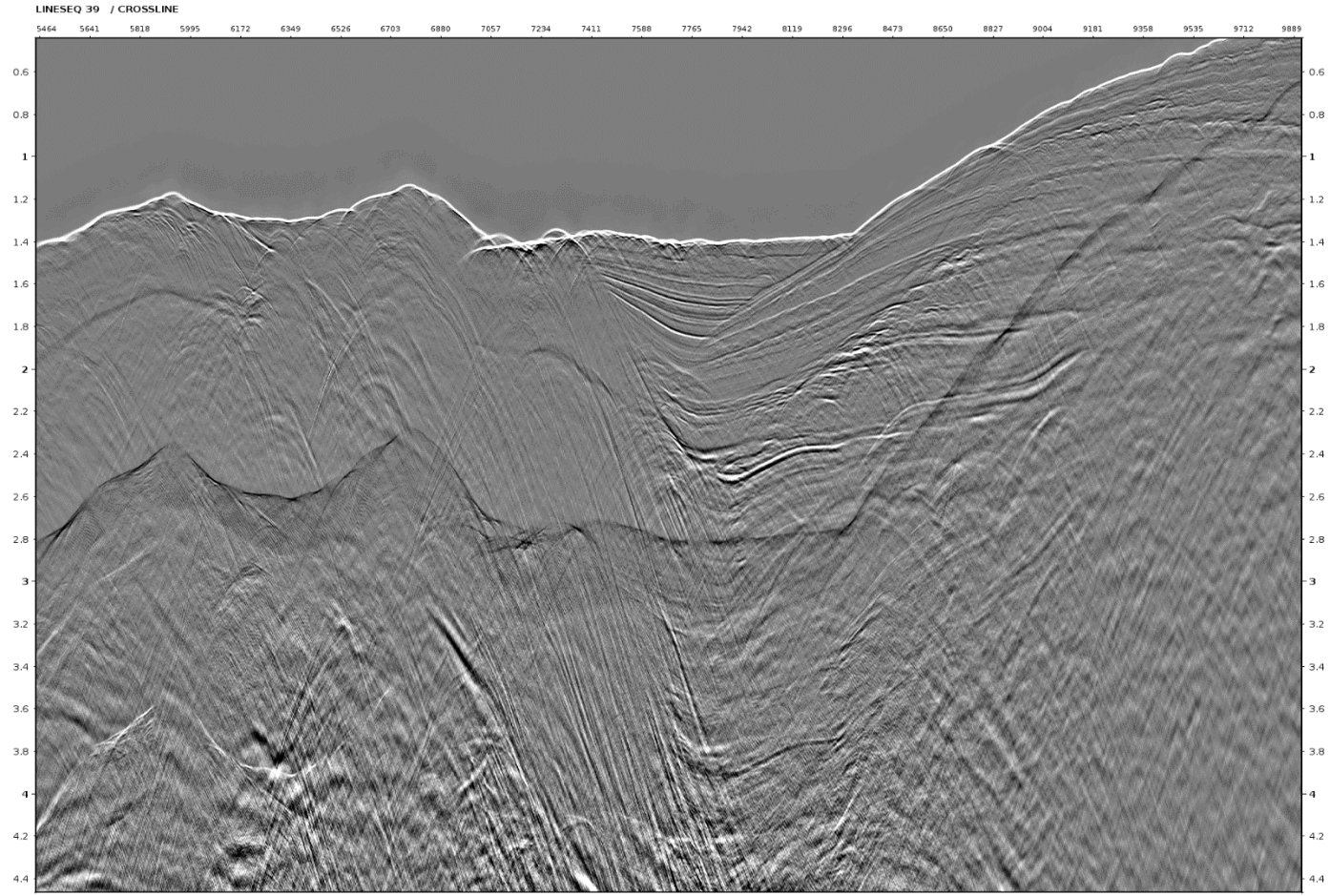
© 2020 CGG

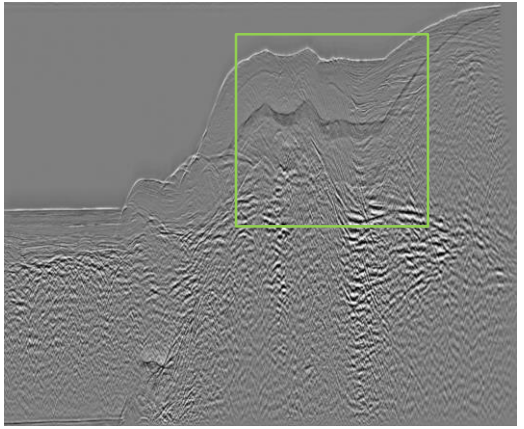
Stack after SRME & MWD Subtraction



© 2020 CGG

Zoom in Stack before Subtraction

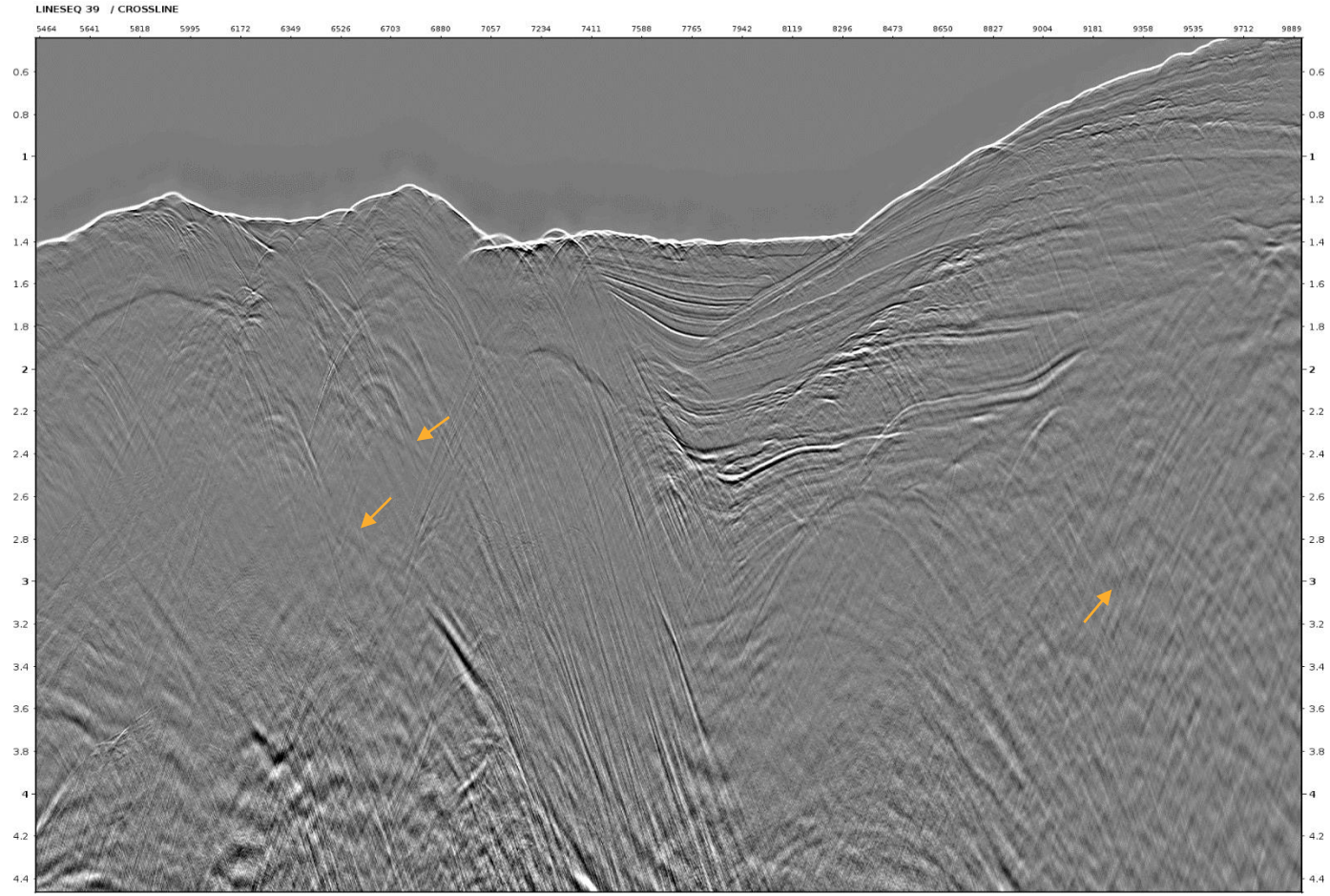


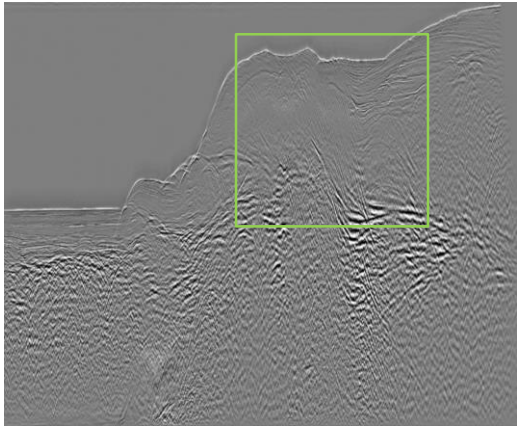


- Primaries are protected by simultaneous subtraction flow.

© 2020 CGG

Zoom in Stack after SRME Subtraction

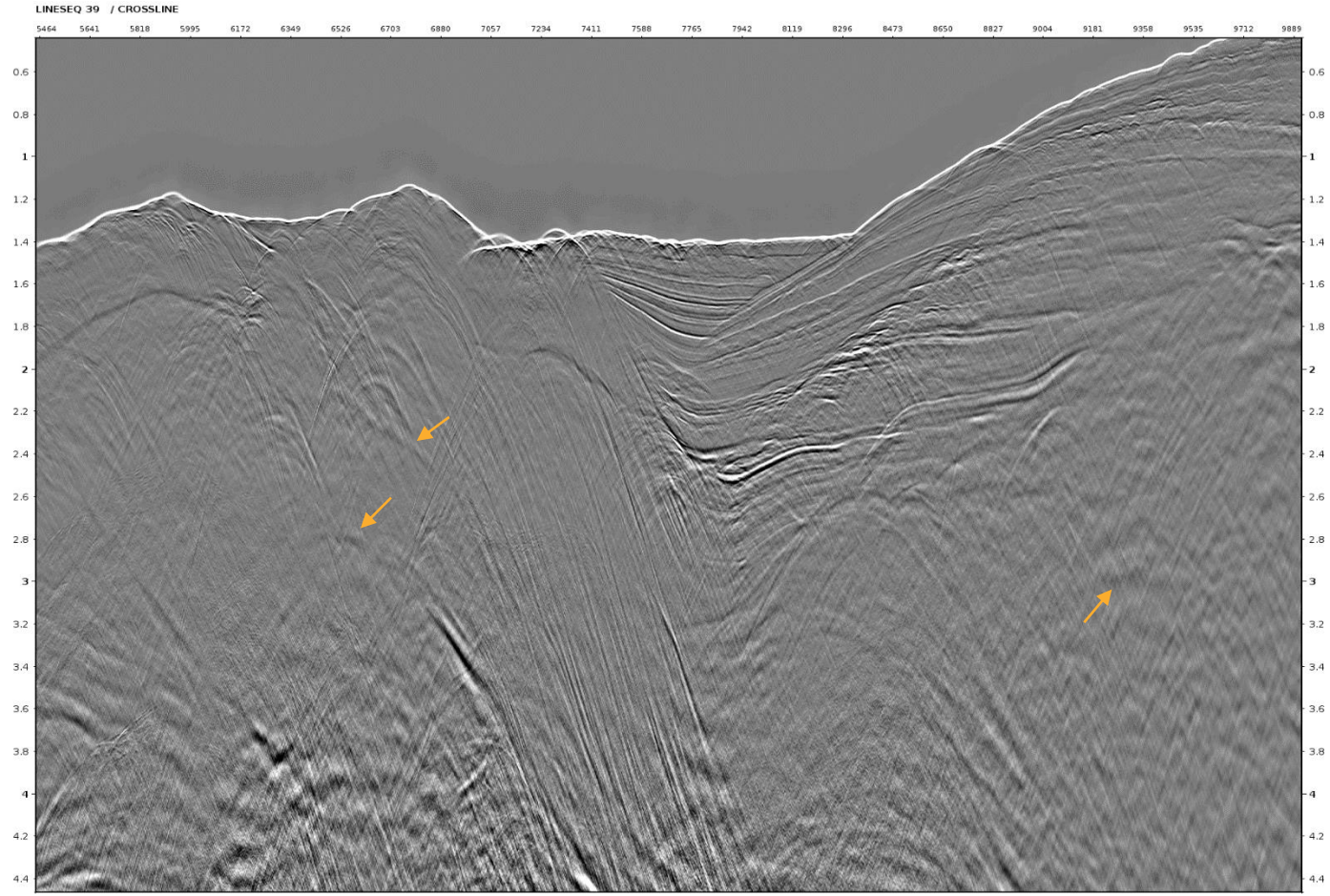


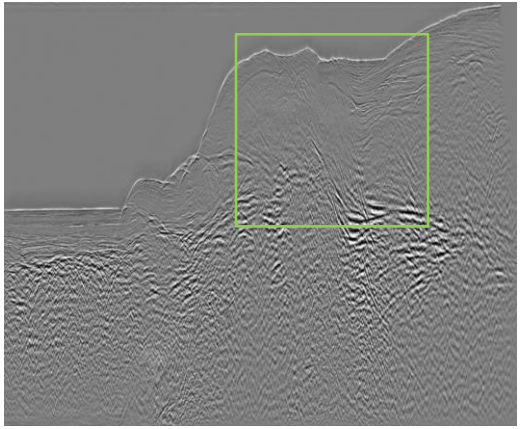


- Primaries are protected by simultaneous subtraction flow.

© 2020 CGG

Zoom in Stack after SRME & MWD Subtraction

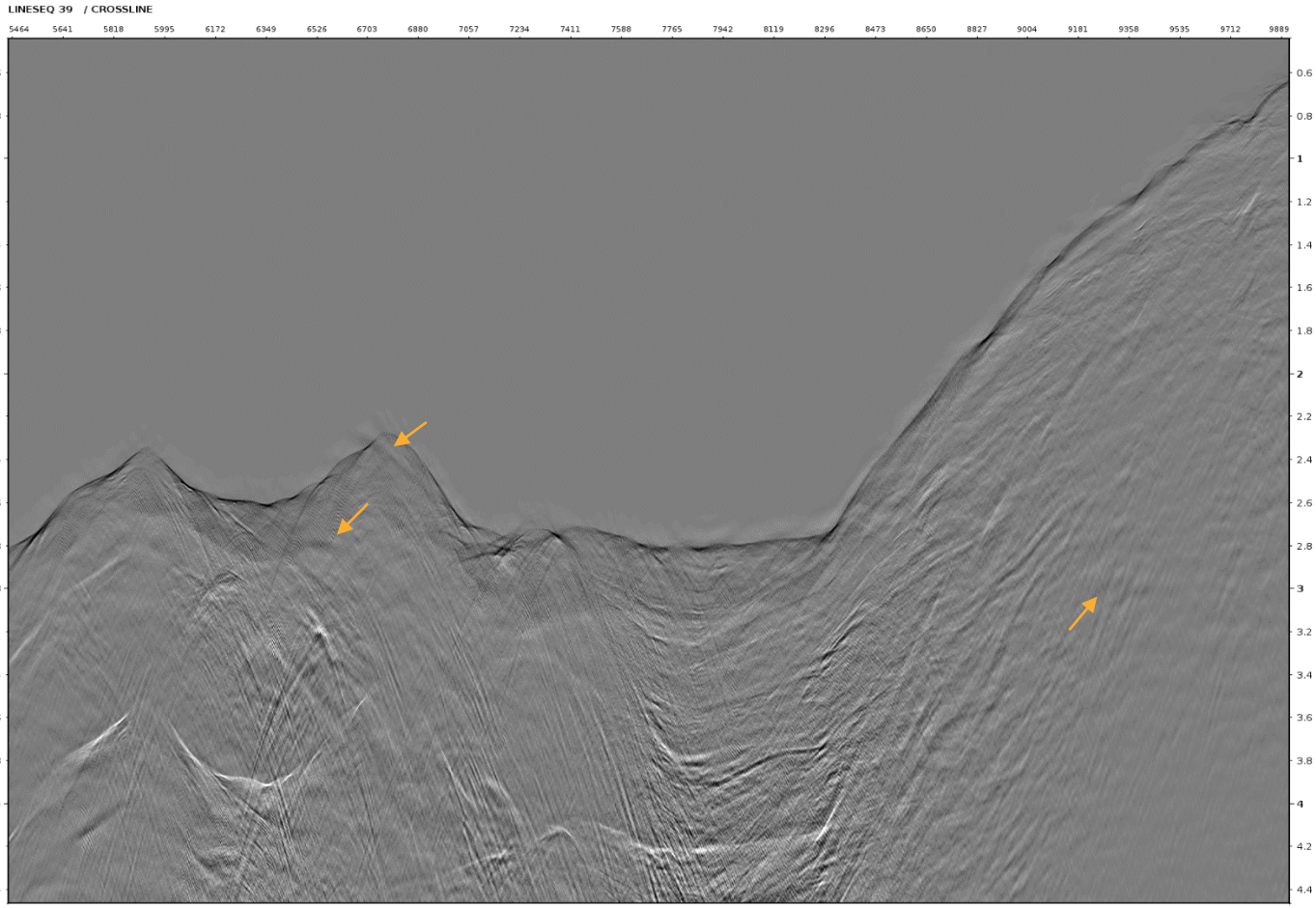




- Primaries are protected by simultaneous subtraction flow.

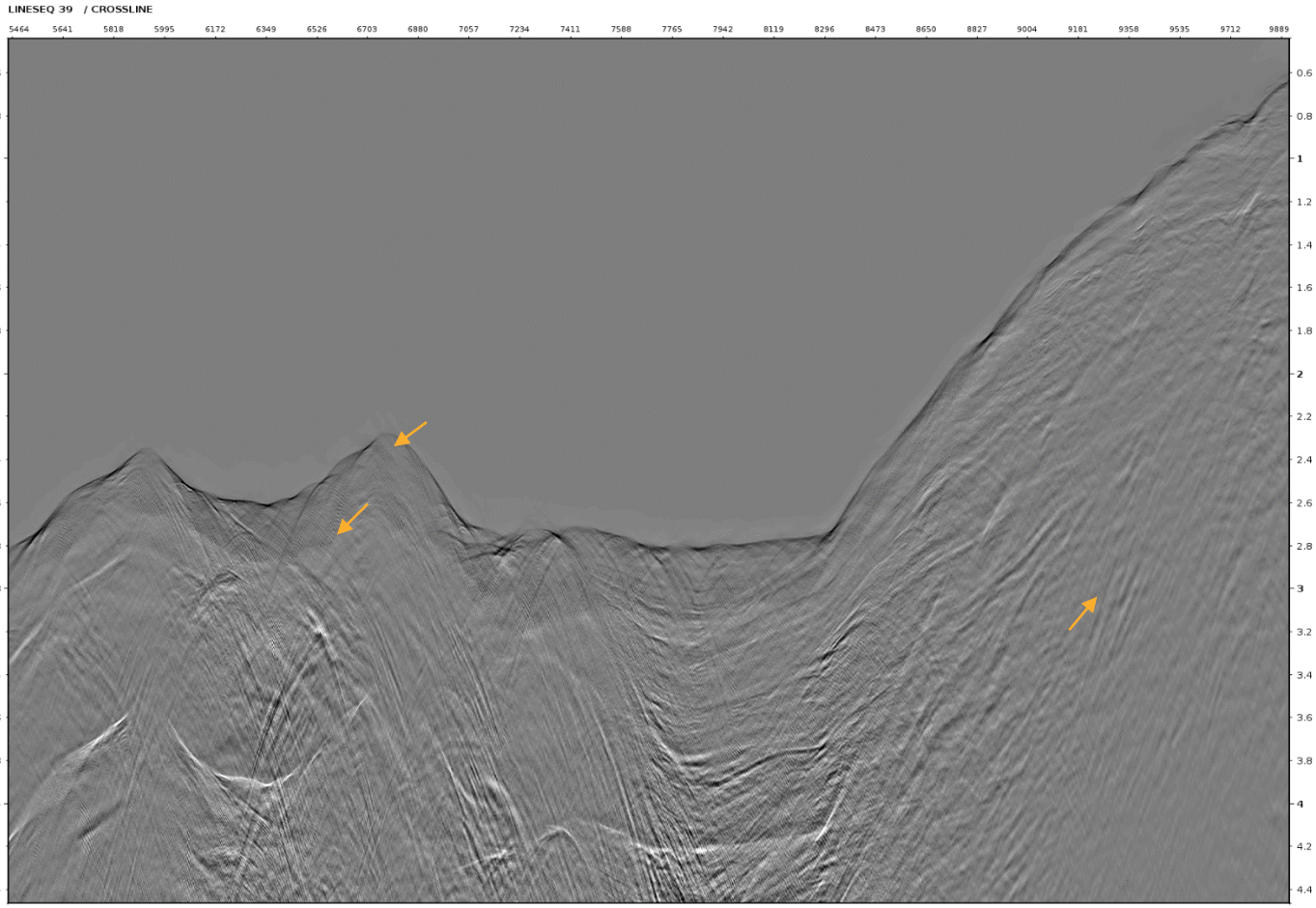
© 2020 CGG

Difference before – after SRME Subtraction



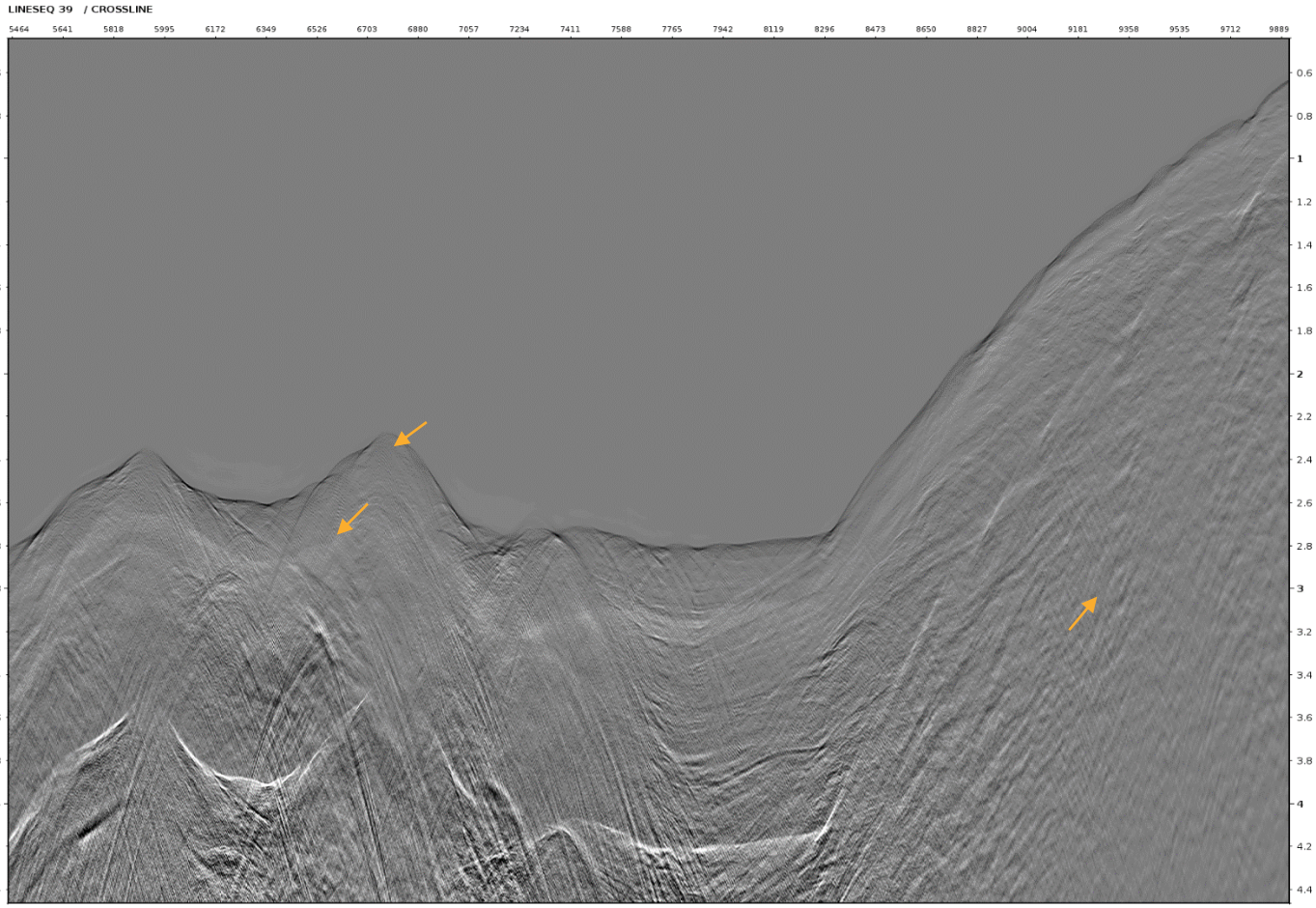
© 2020 CGG

Difference before – after SRME & MWD Subtraction



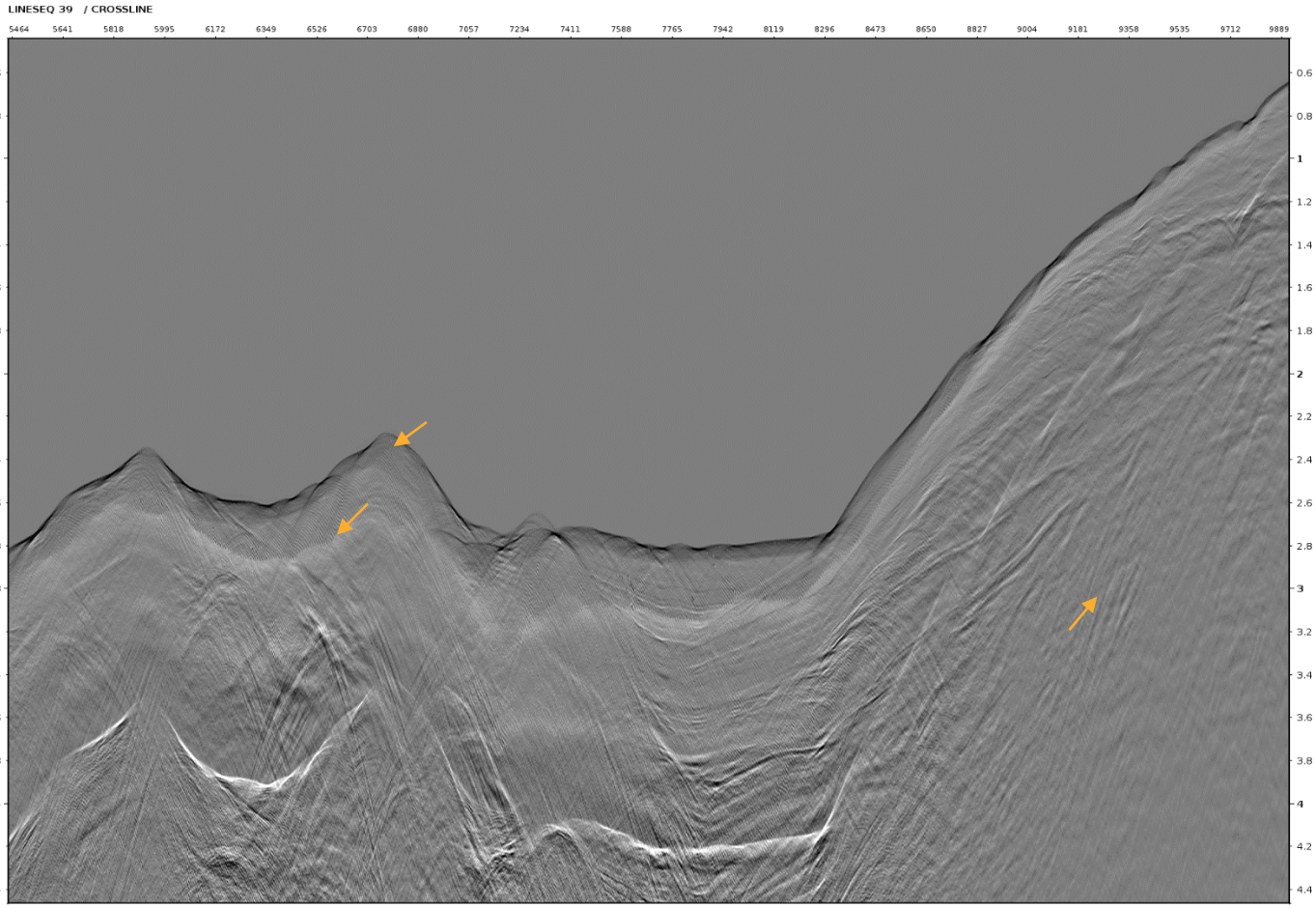
© 2020 CGG

Zoom in Stack – SRME Model



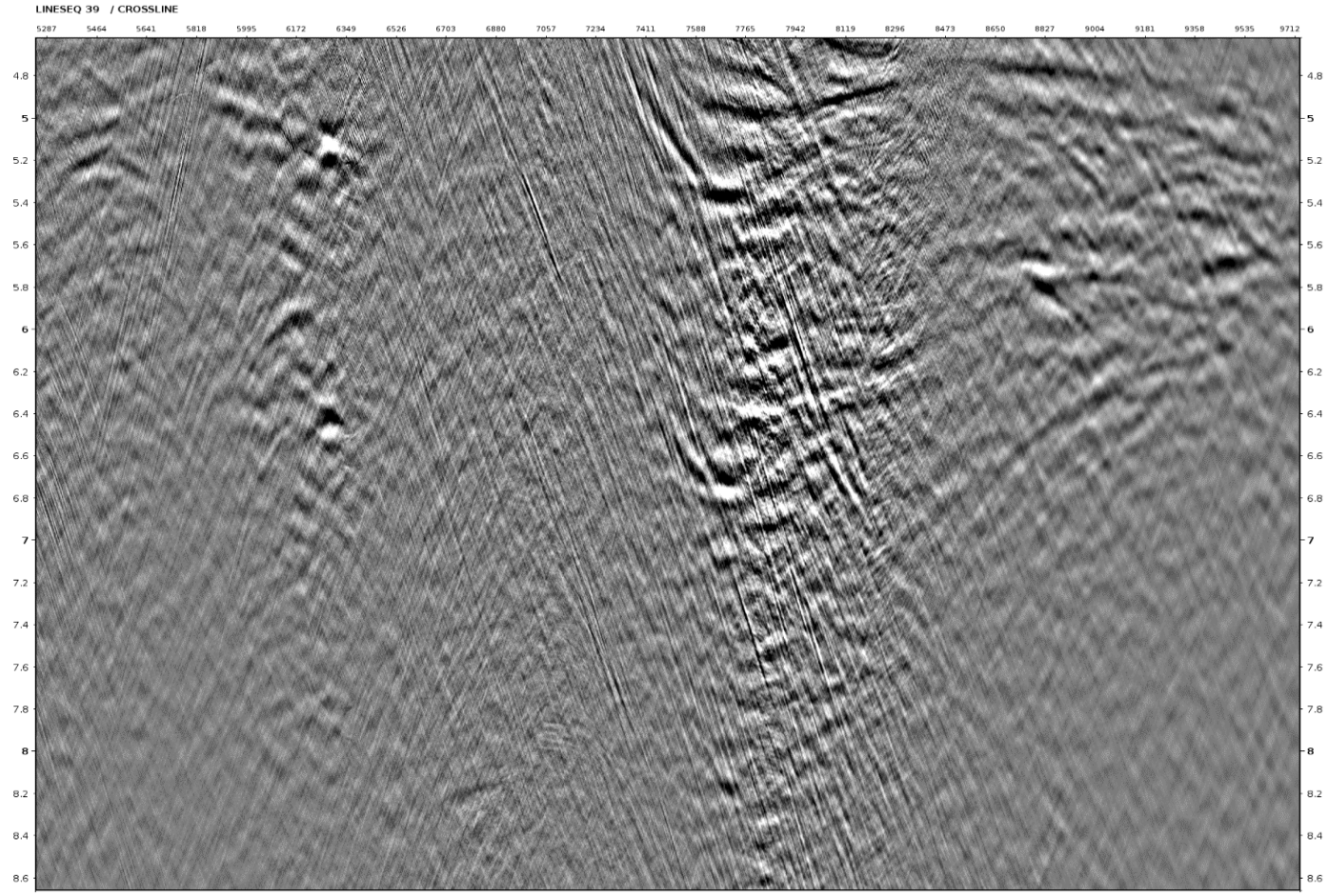
© 2020 CGG

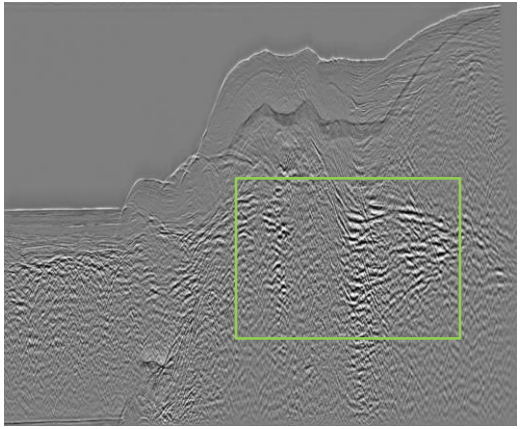
Zoom in Stack – MWD Model



© 2020 CGG

Zoom in Stack before Subtraction

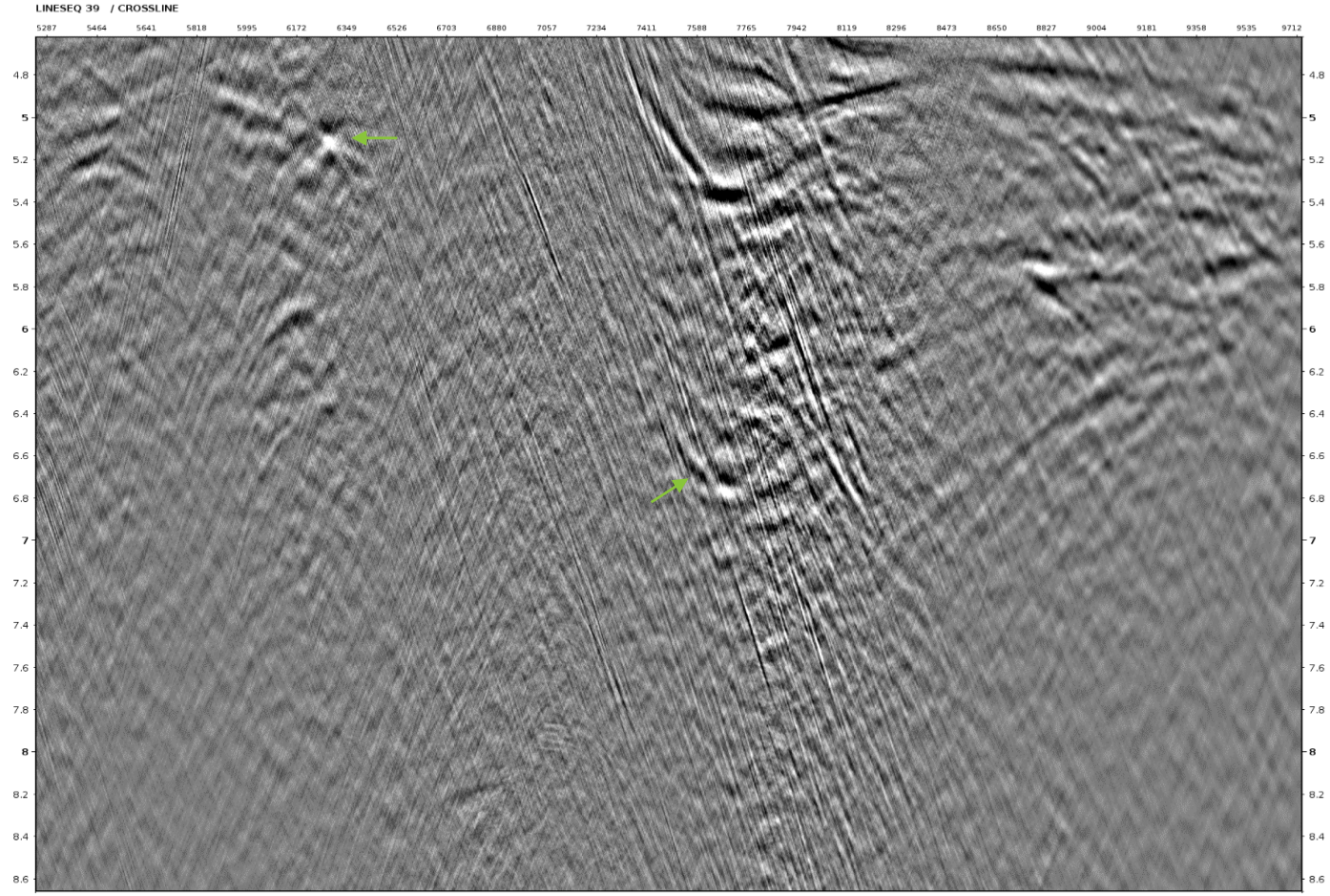


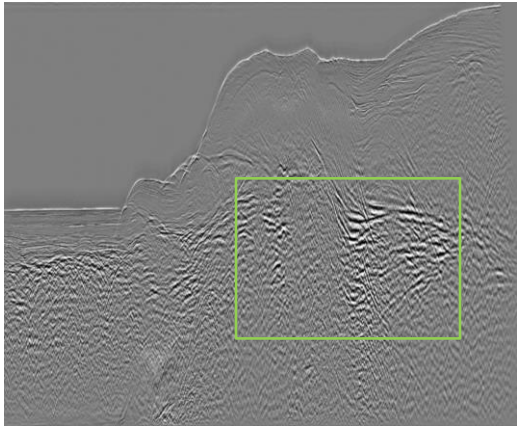


- Multiples are better attenuated with simultaneous subtraction.

© 2020 CGG

Zoom in Stack after SRME Subtraction

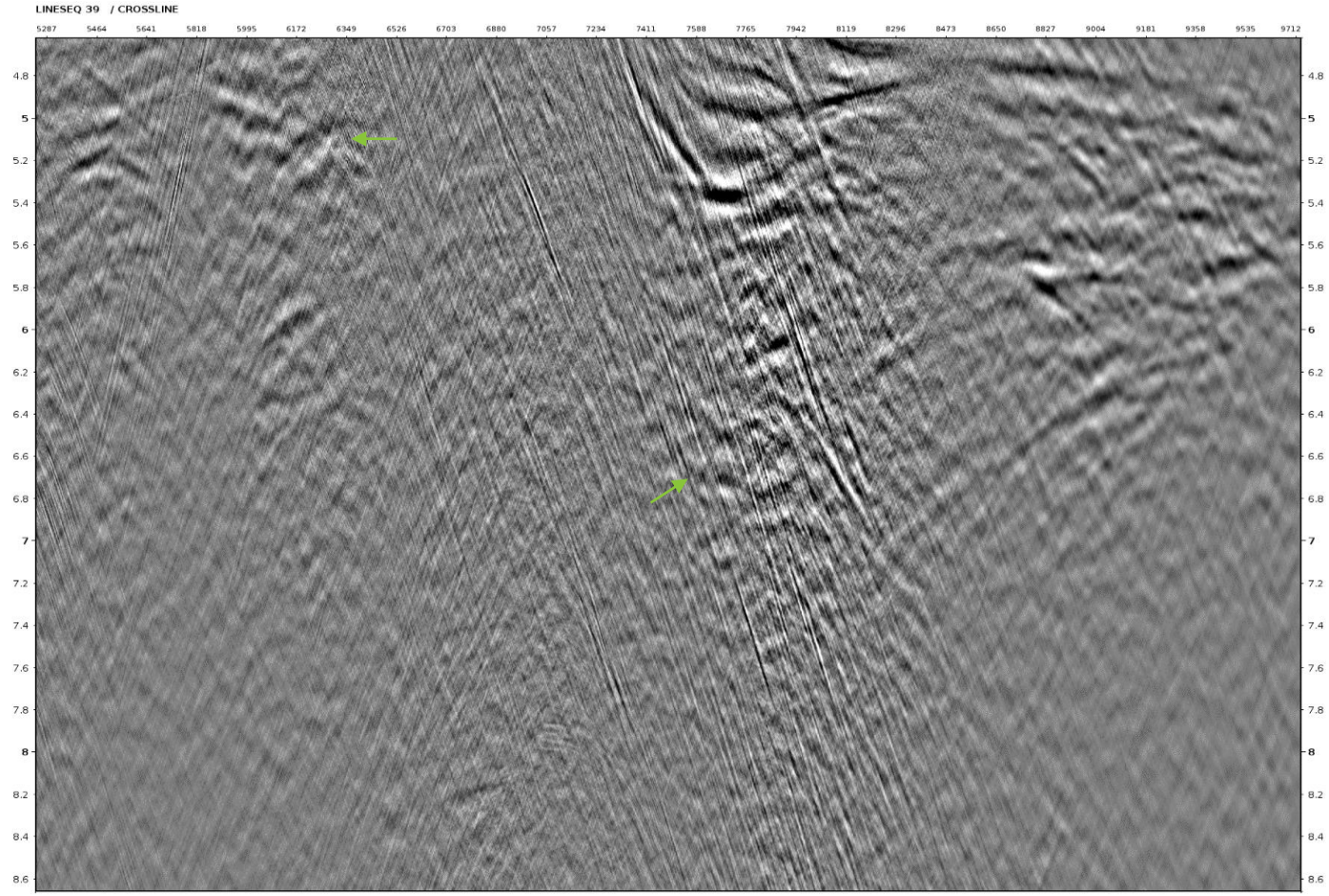


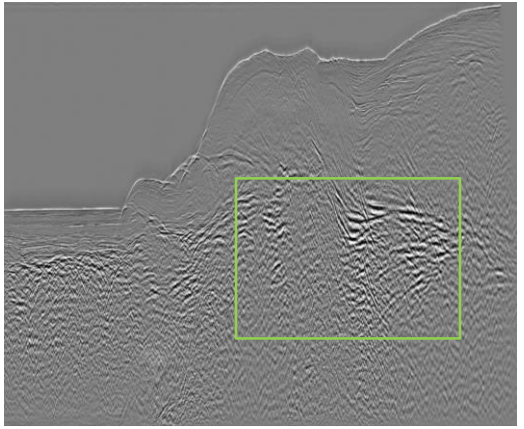


- Multiples are better attenuated with simultaneous subtraction.

© 2020 CGG

Zoom in Stack after SRME & MWD Subtraction

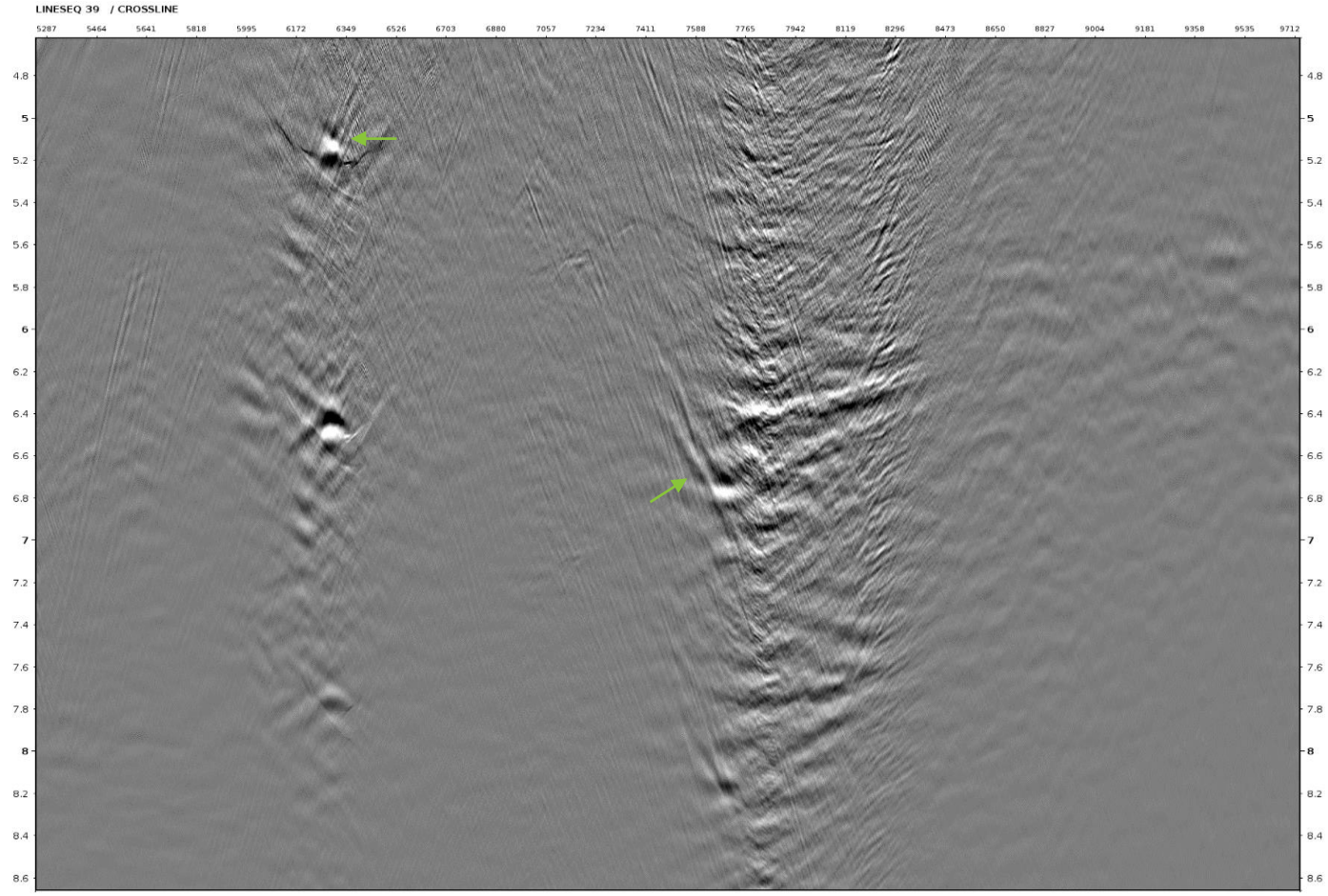




- Multiples are better attenuated with simultaneous subtraction.

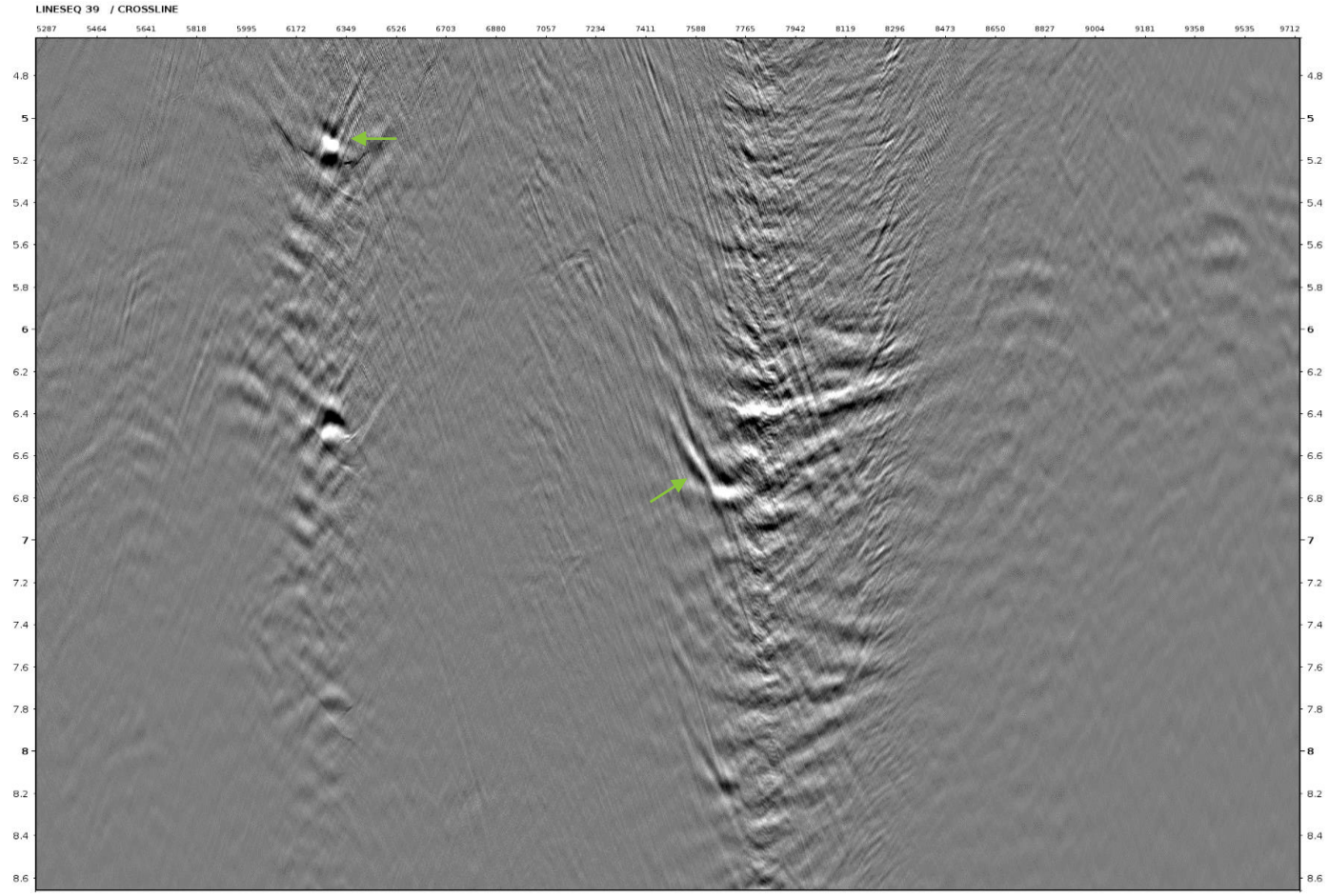
© 2020 CGG

Difference before – after SRME Subtraction



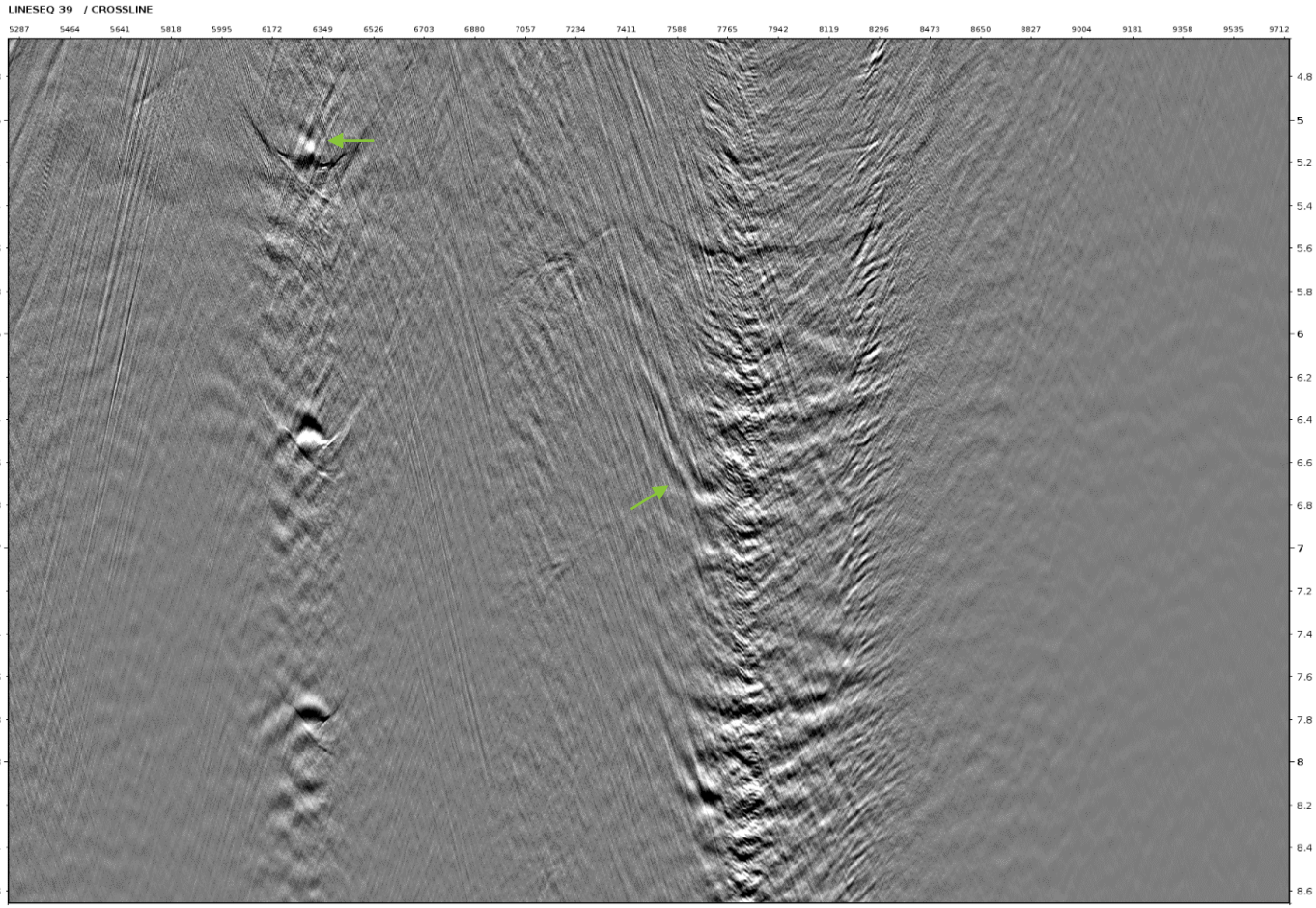
© 2020 CGG

Difference before – after SRME & MWD Subtraction



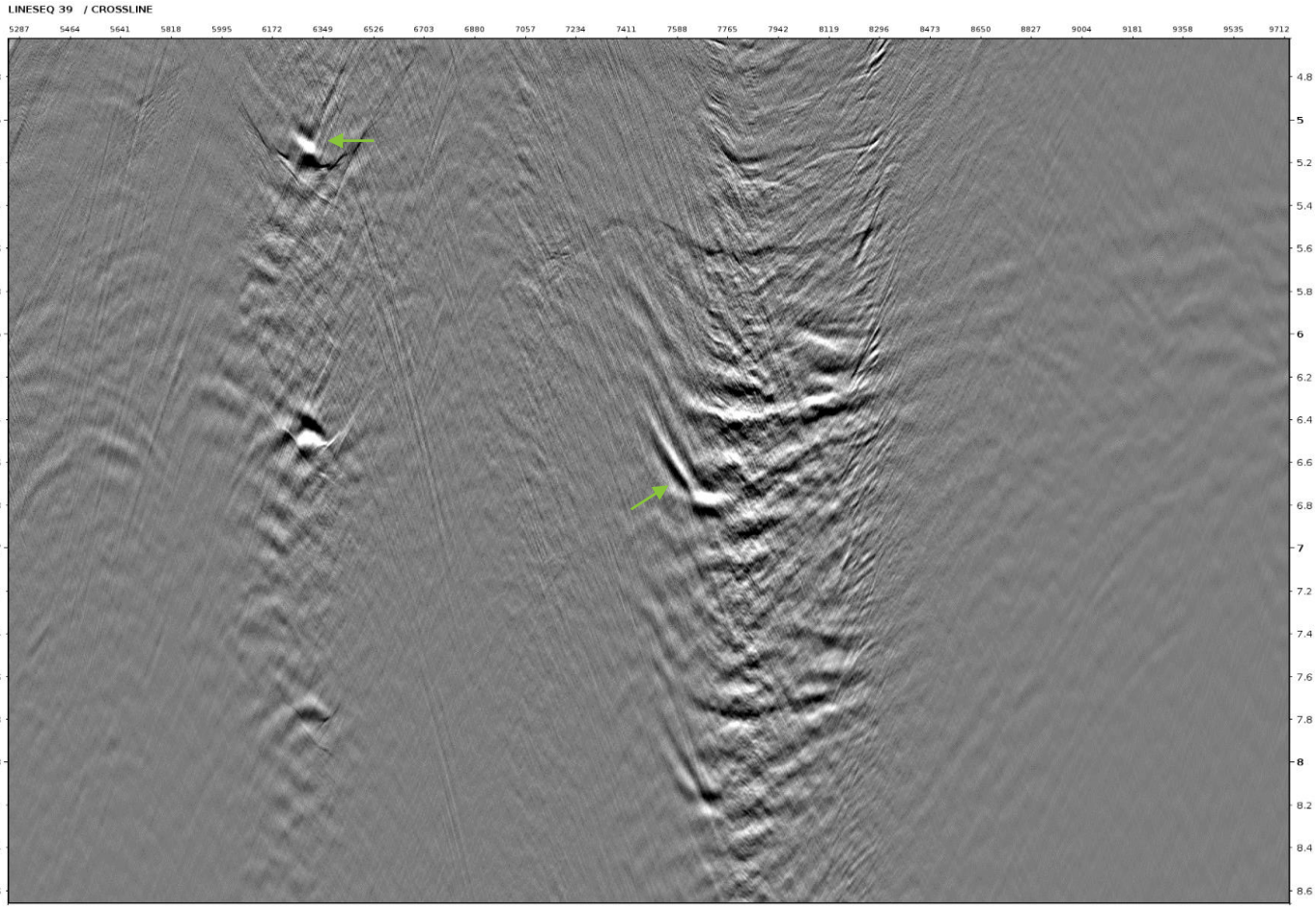
© 2020 CGG

Zoom in Stack – SRME Model



© 2020 CGG

Zoom in Stack – MWD Model



© 2020 CGG

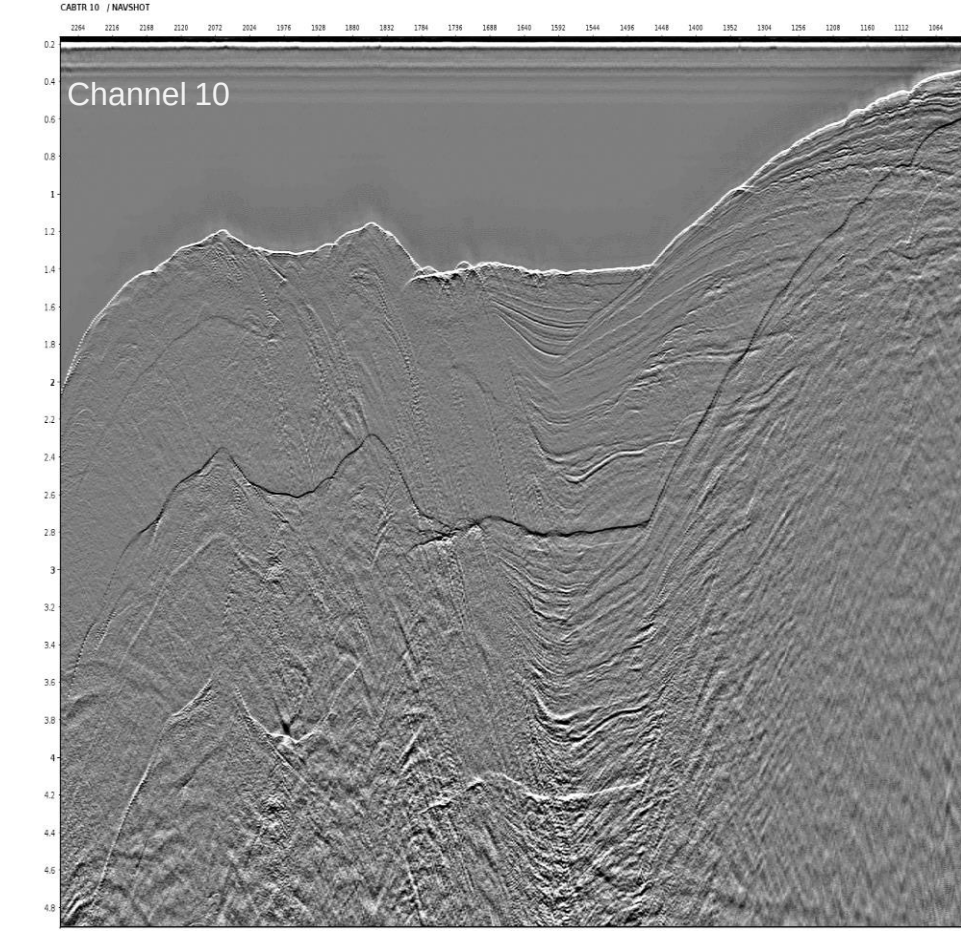
Seq 039

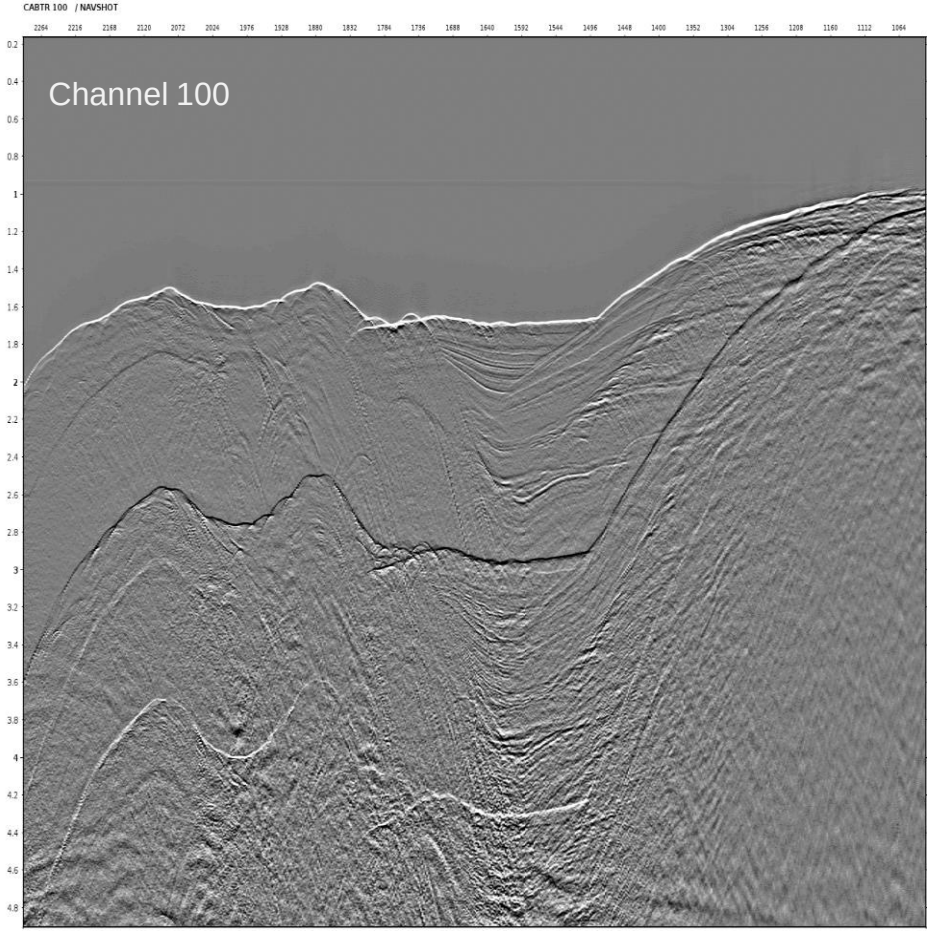
Stack

Common Channel

Shot Gathers

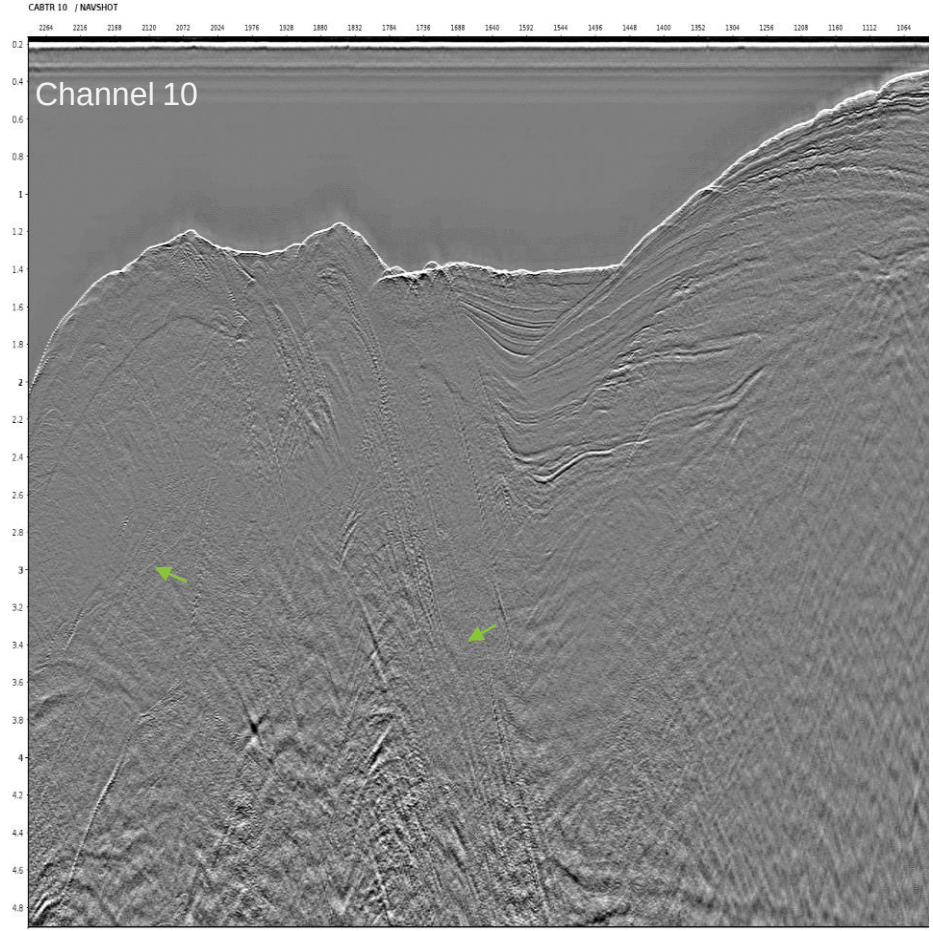
Common Channel before Subtraction

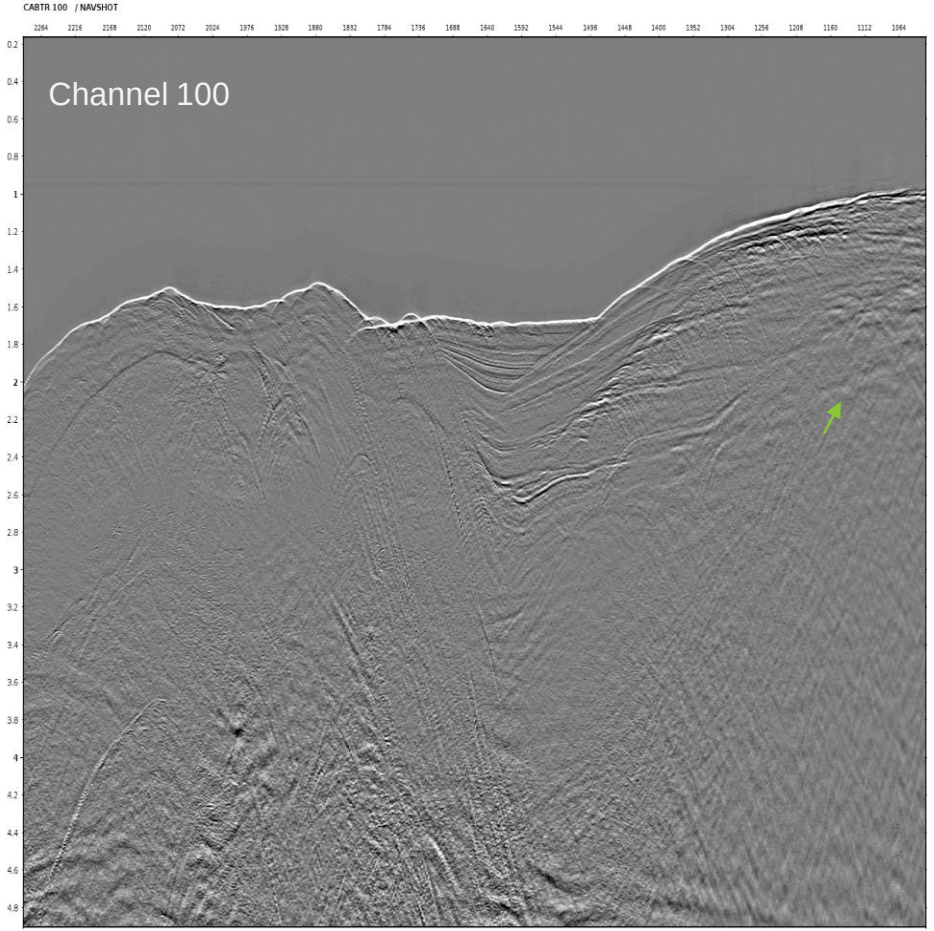




© 2020 CGG

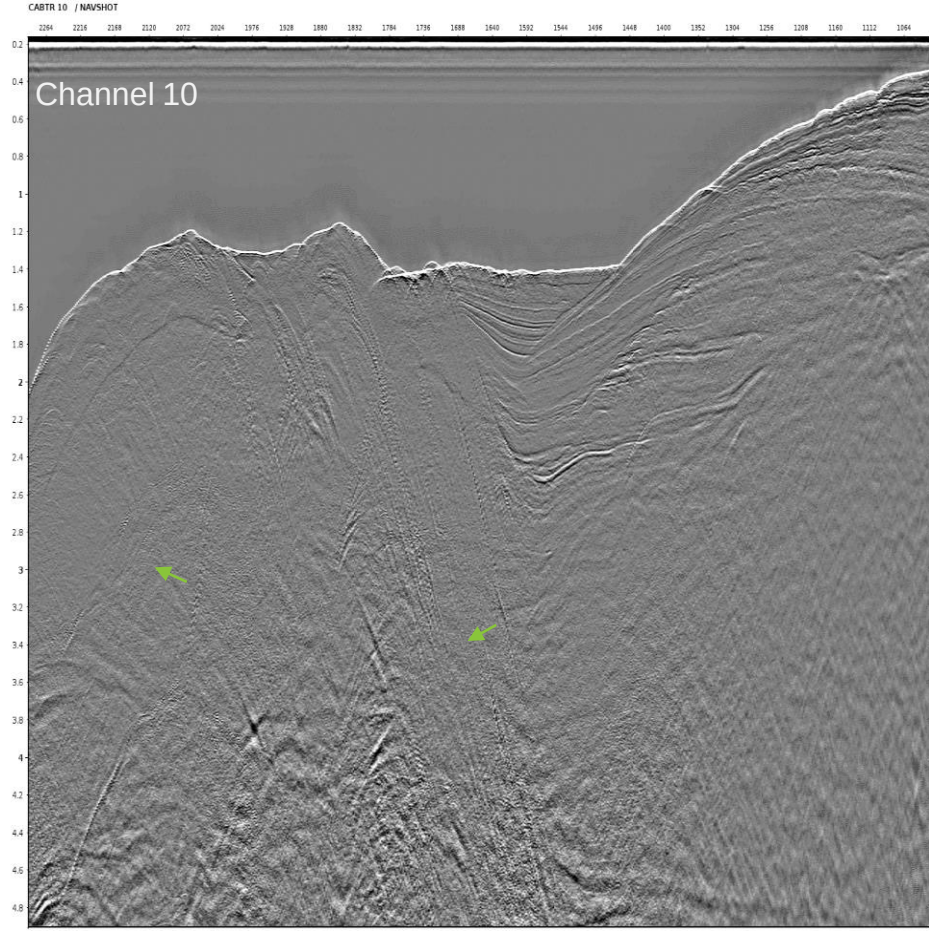
Common Channel after SRME Subtraction

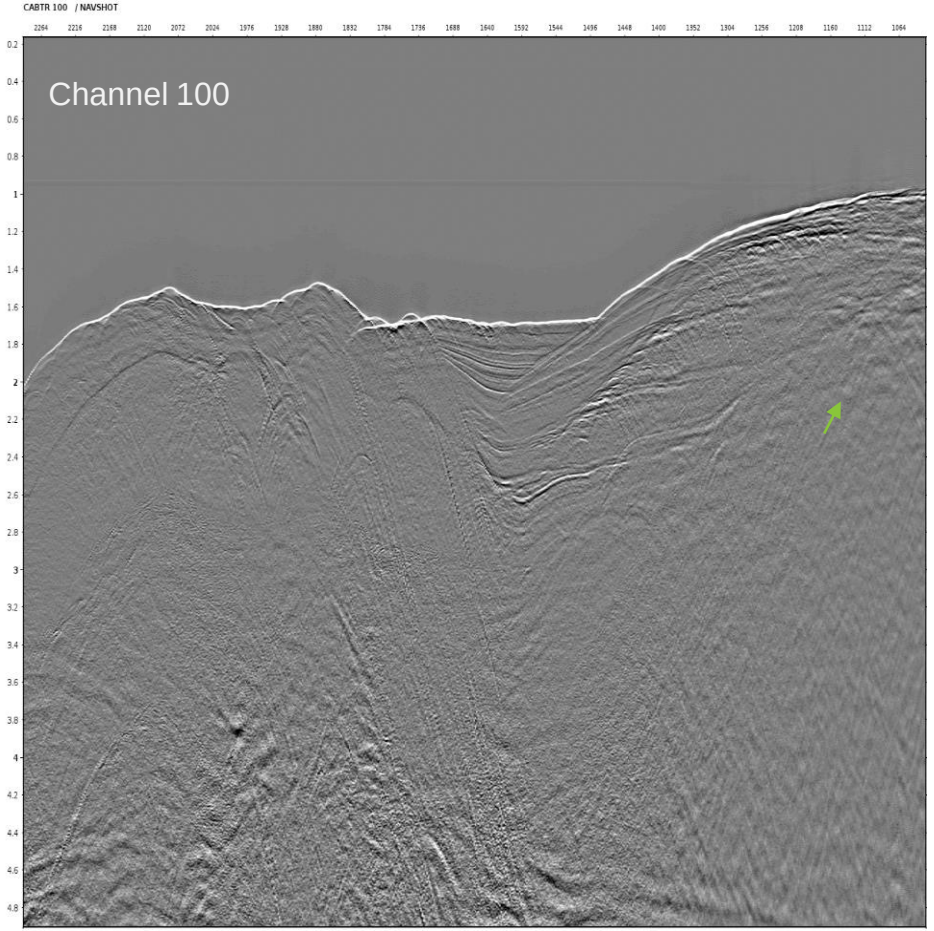




© 2020 CGG

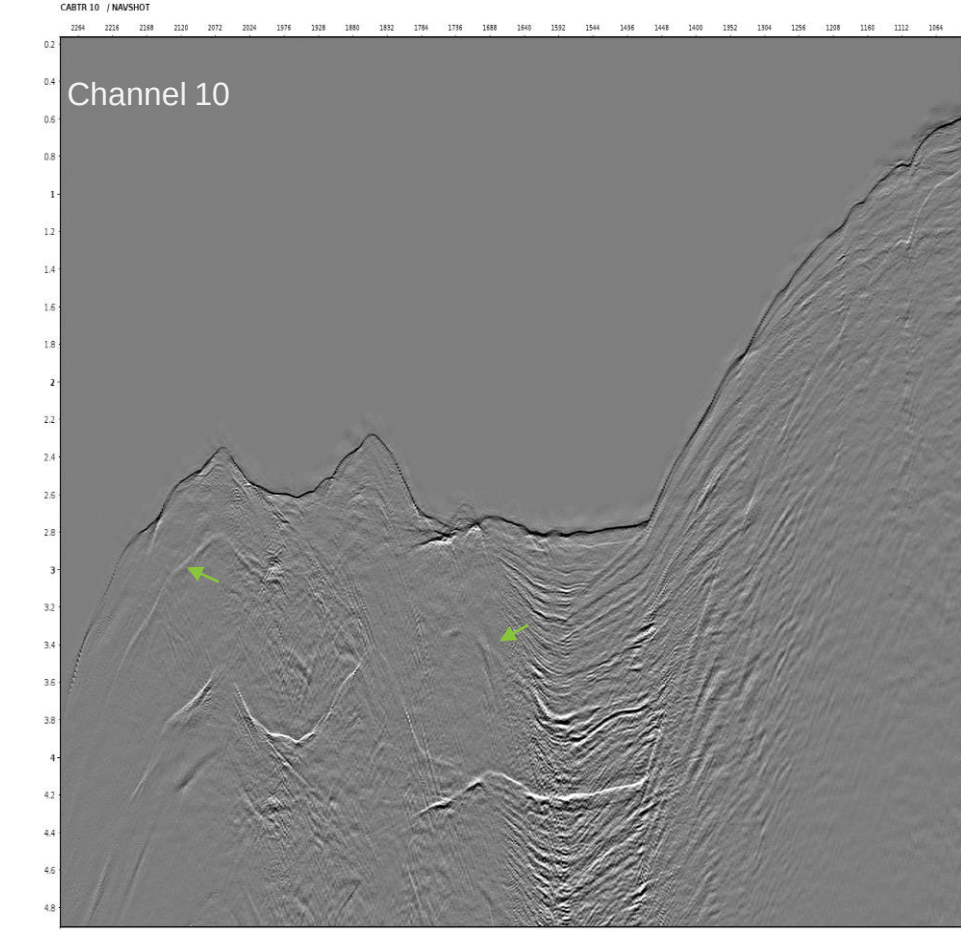
Common Channel after SRME & MWD Subtraction

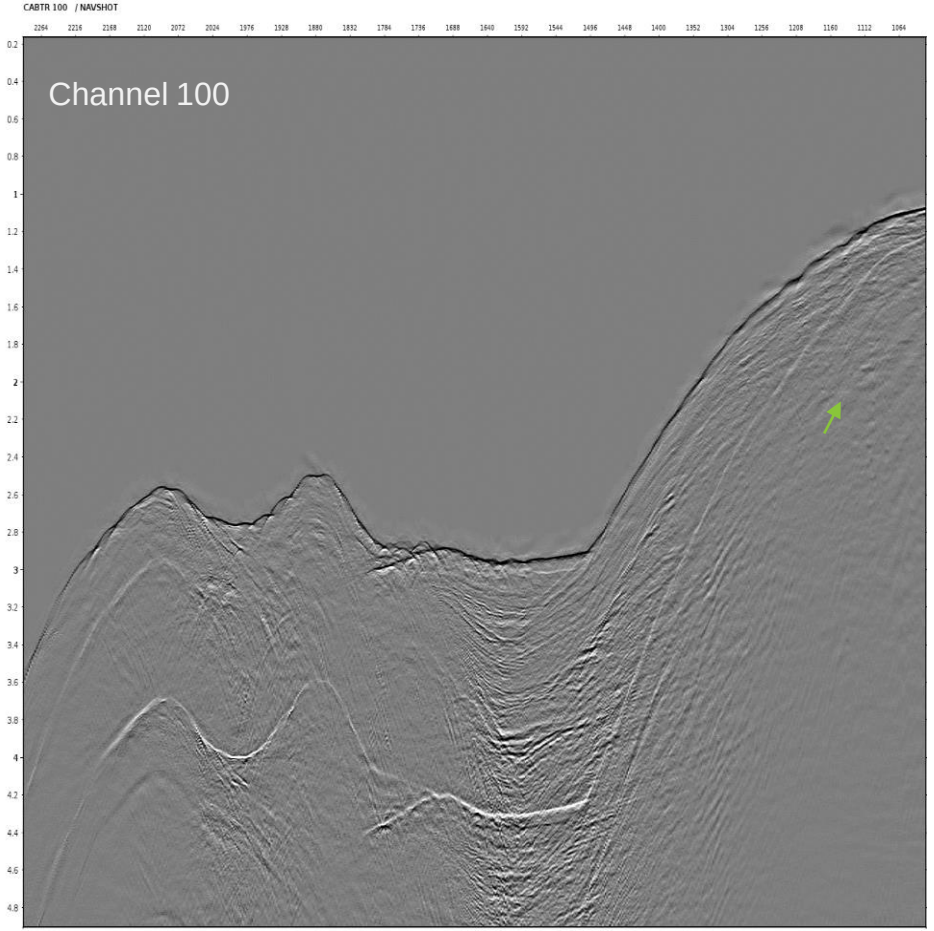




© 2020 CGG

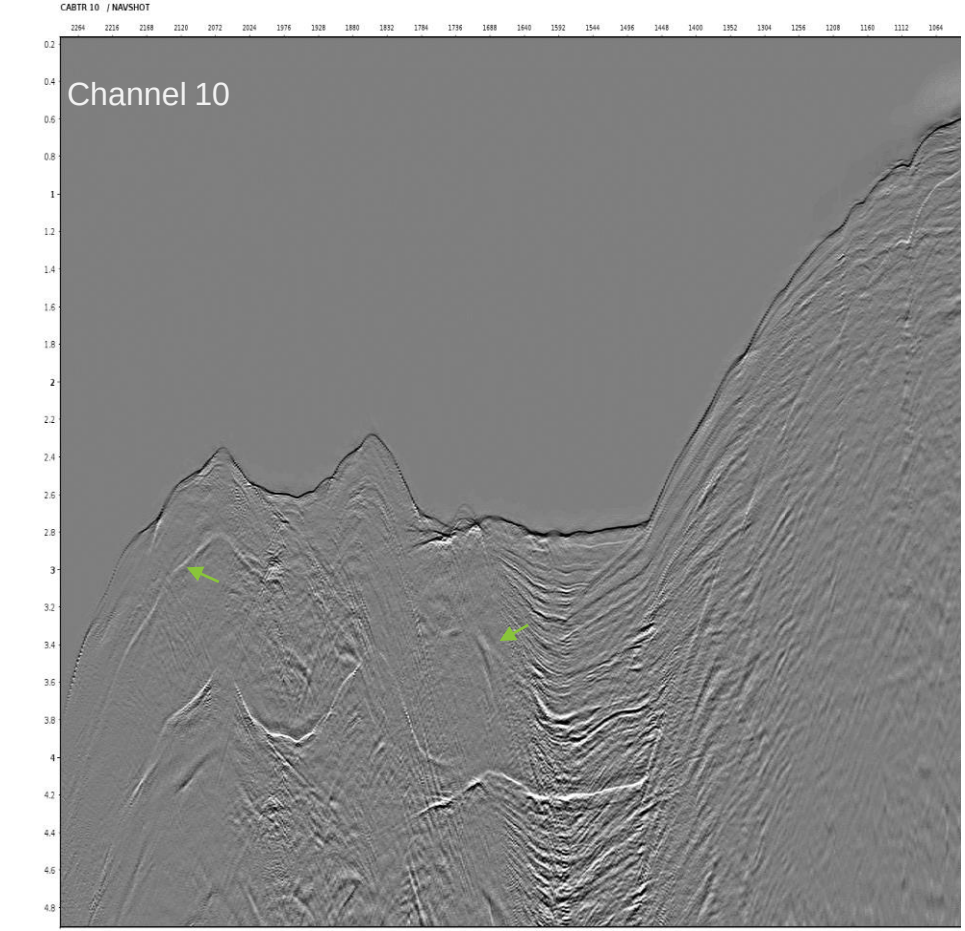
Difference before - after SRME Subtraction

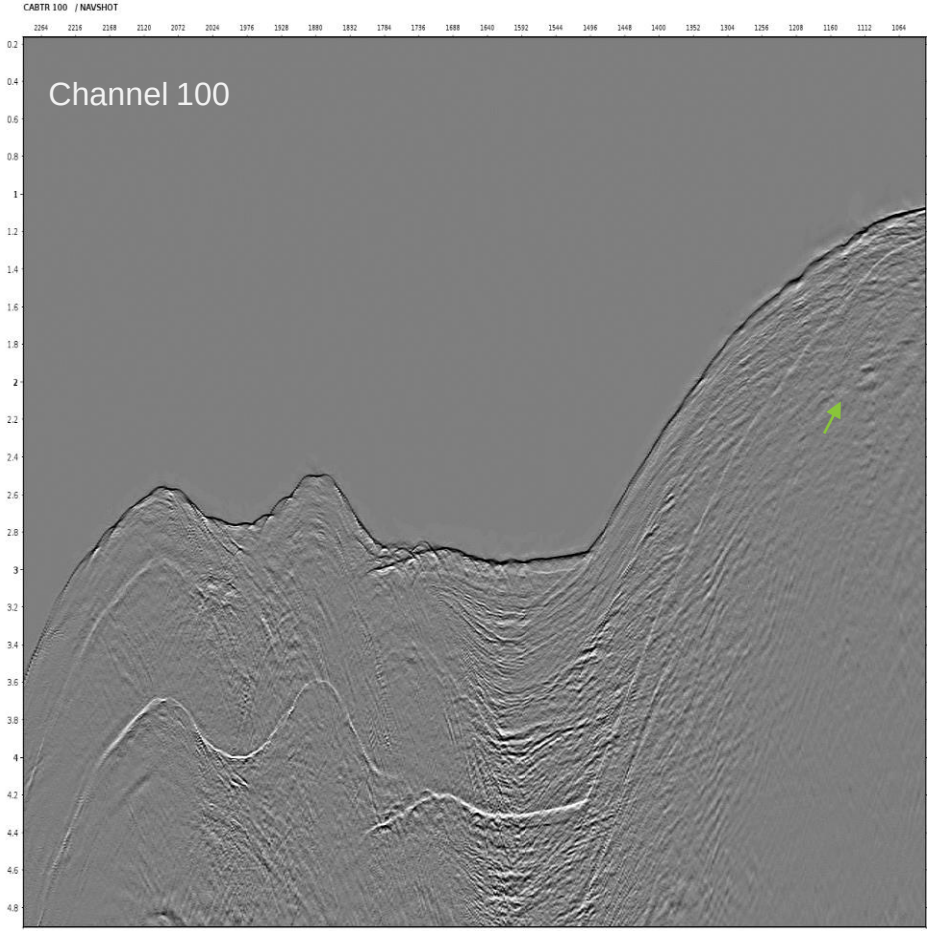




© 2020 CGG

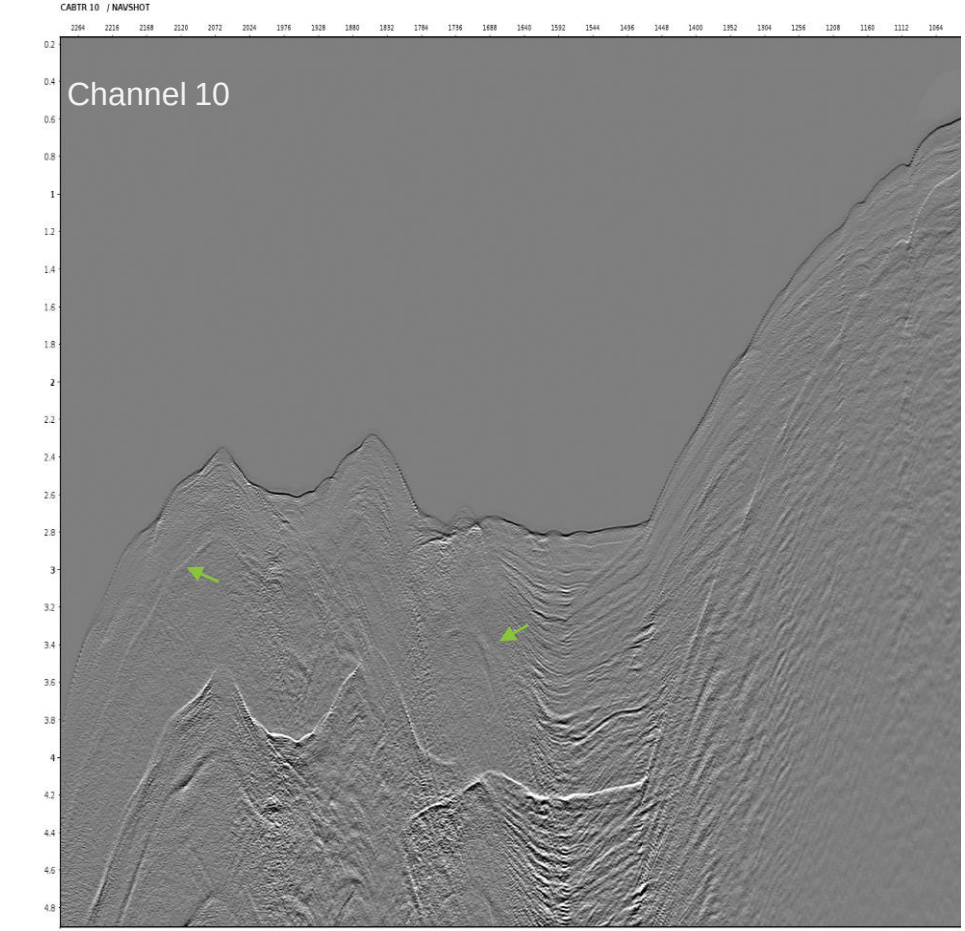
Difference before - after SRME & MWD Subtraction

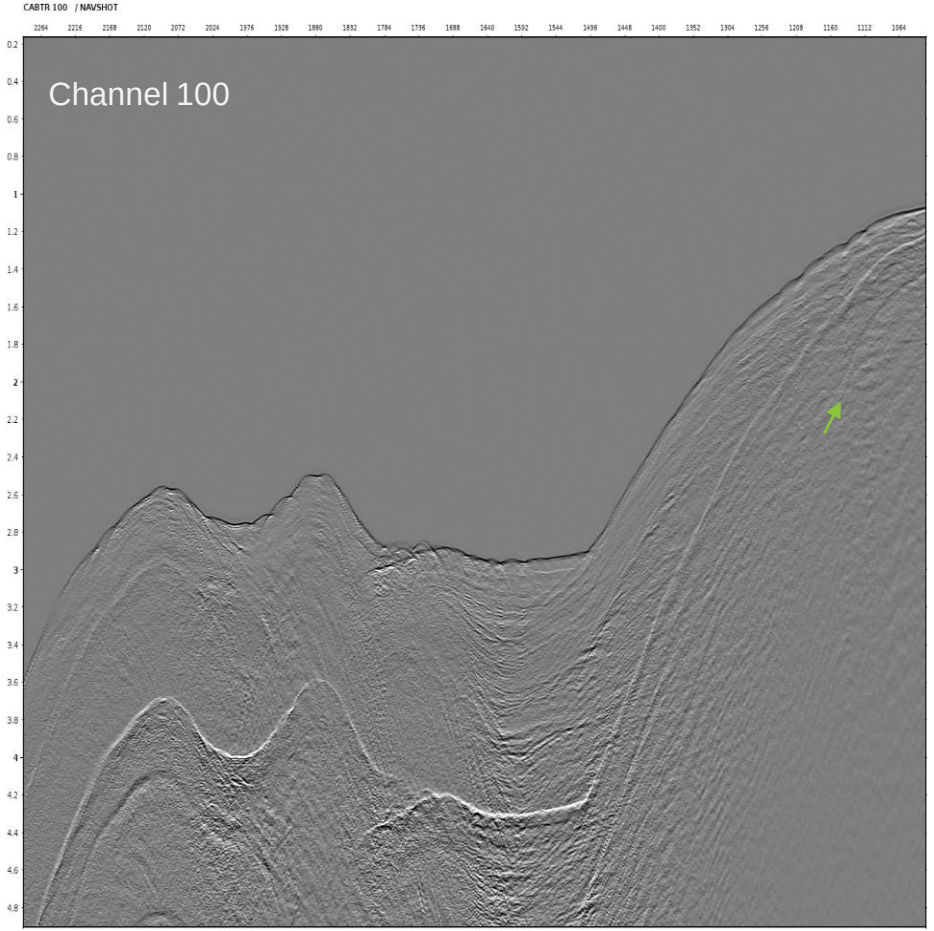




© 2020 CGG

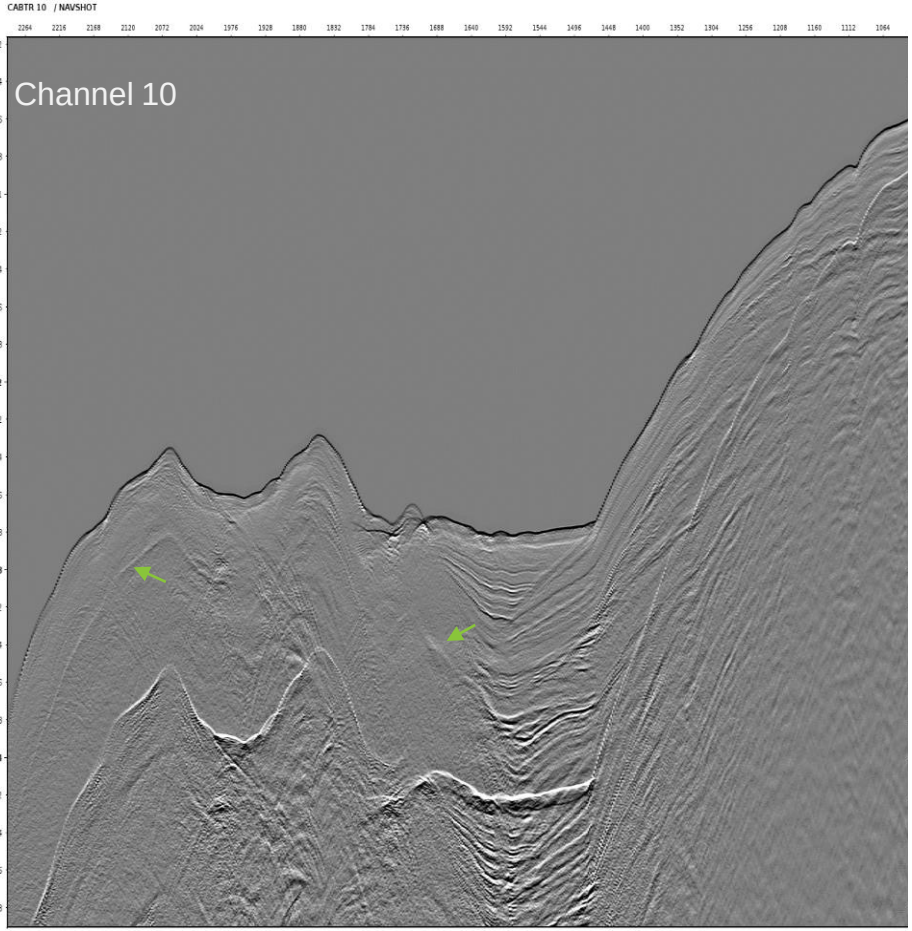
Common Channel SRME Model

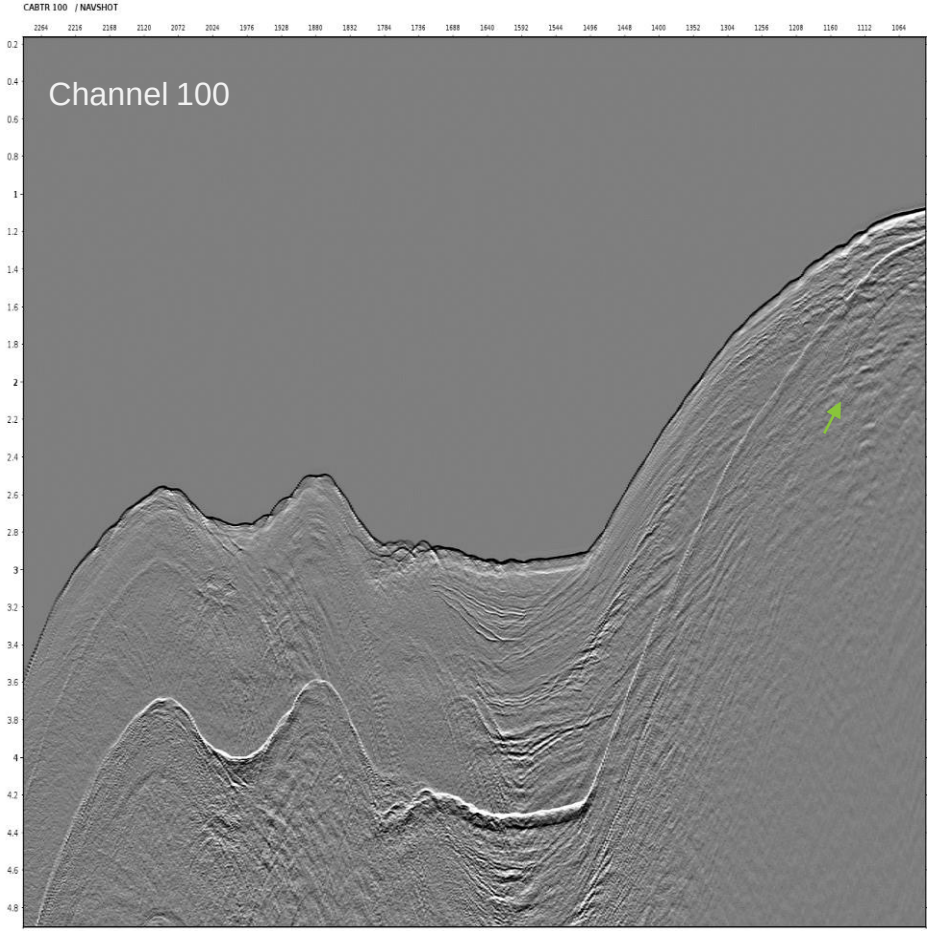




© 2020 CGG

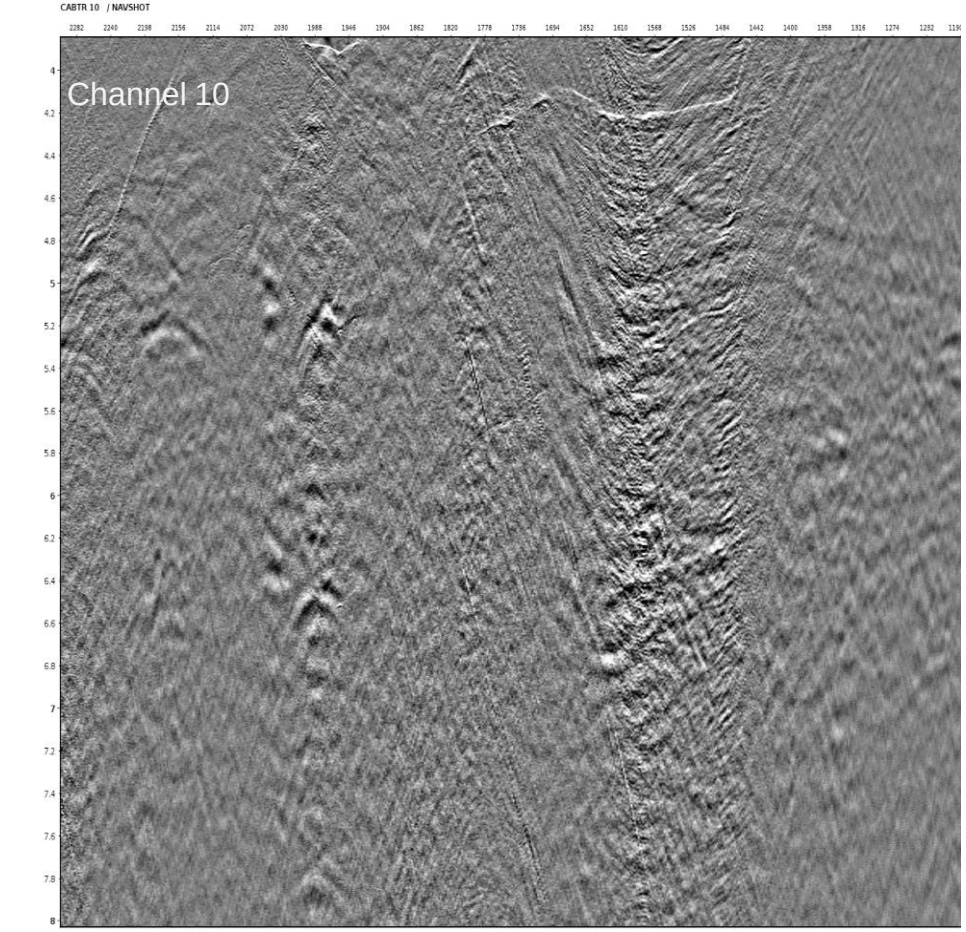
Common Channel MWD Model

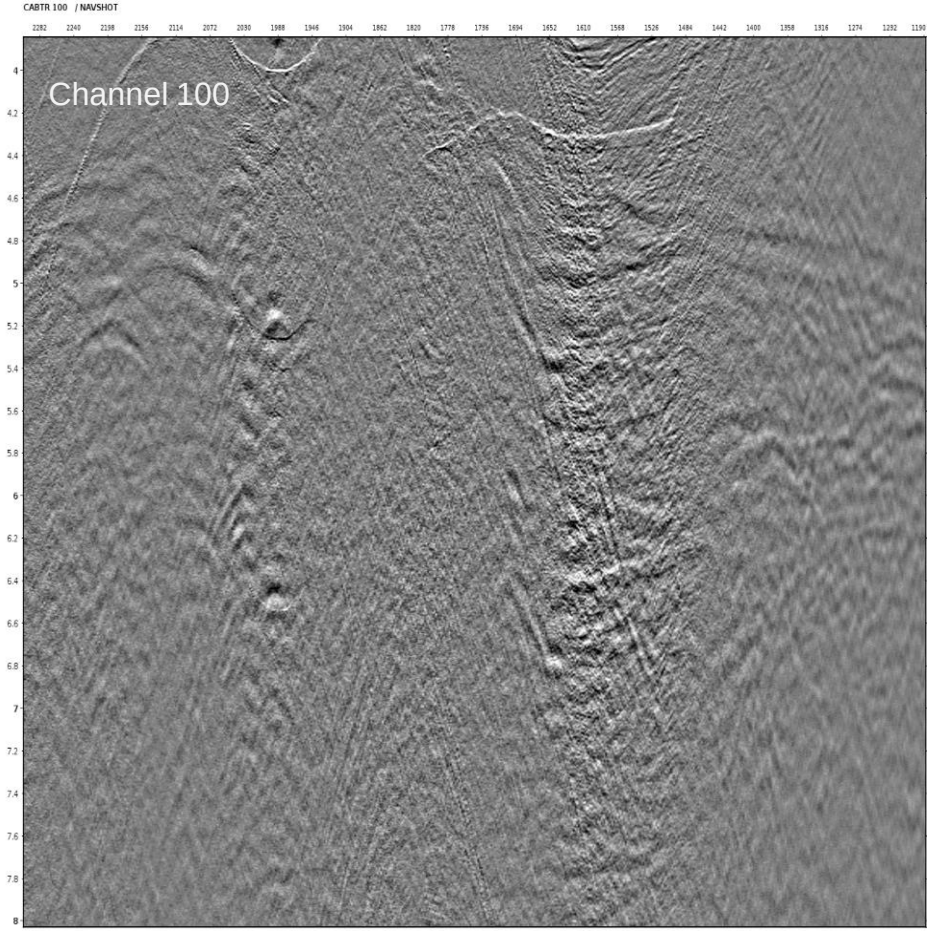




© 2020 CGG

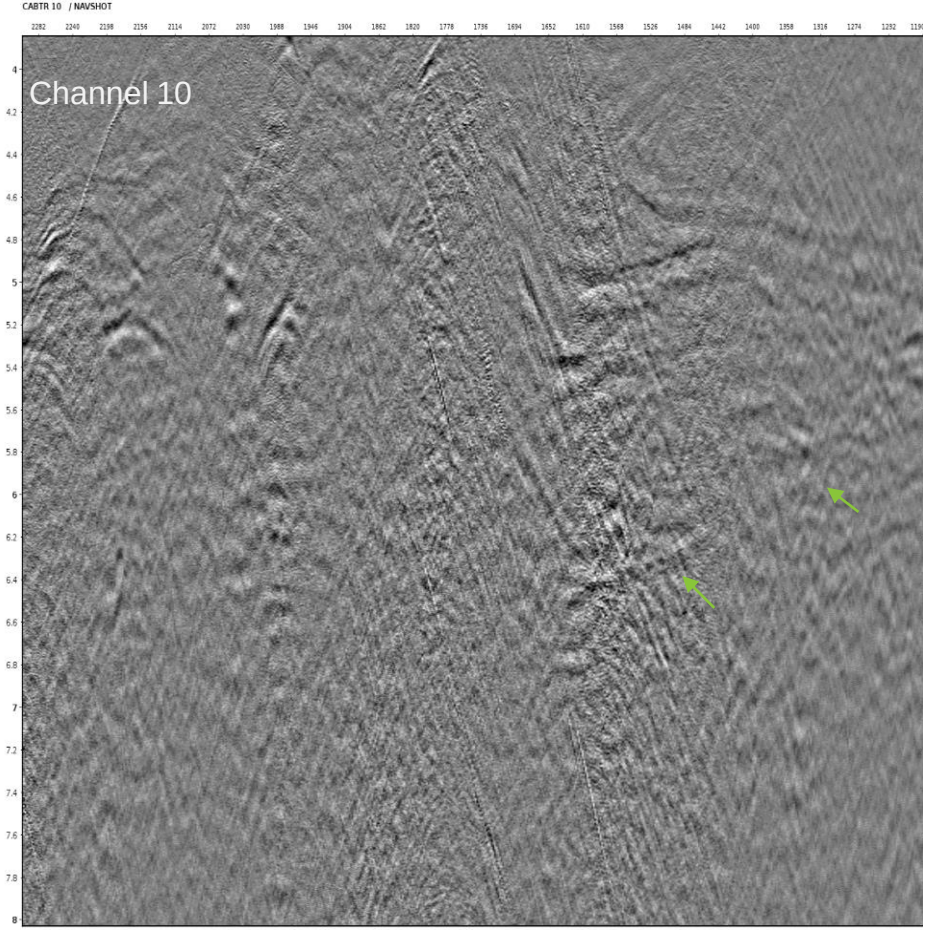
Common Channel before Subtraction

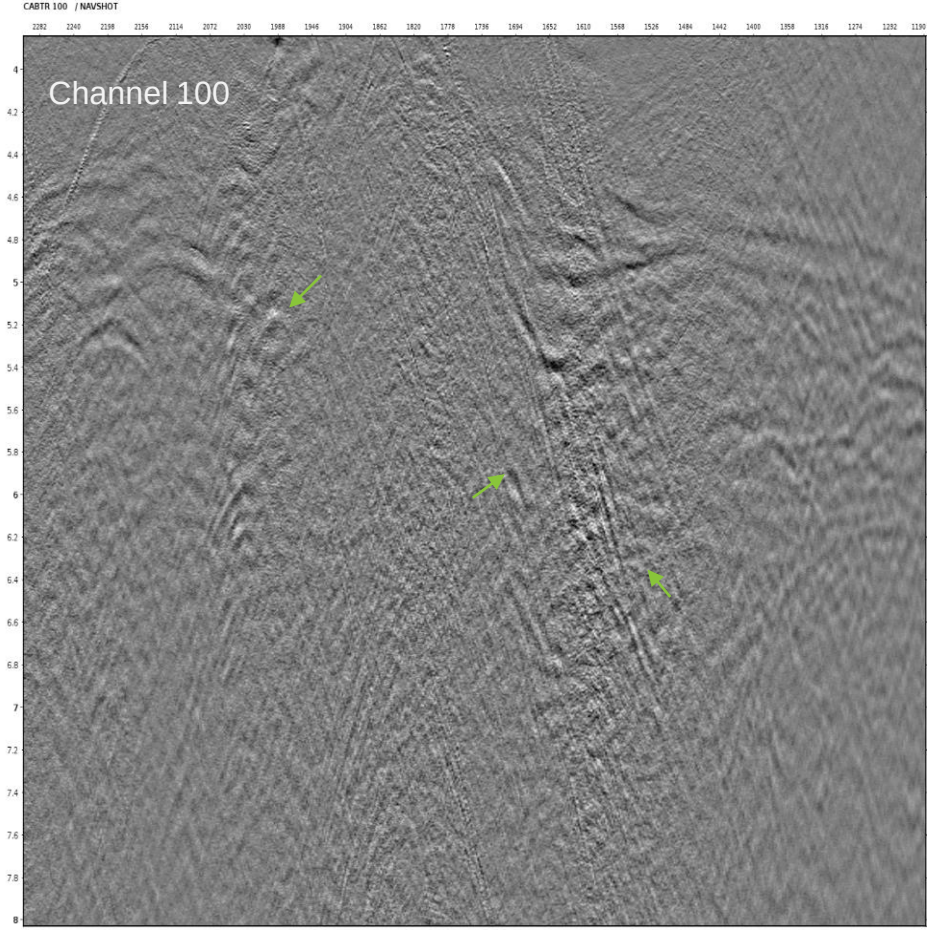




© 2020 CGG

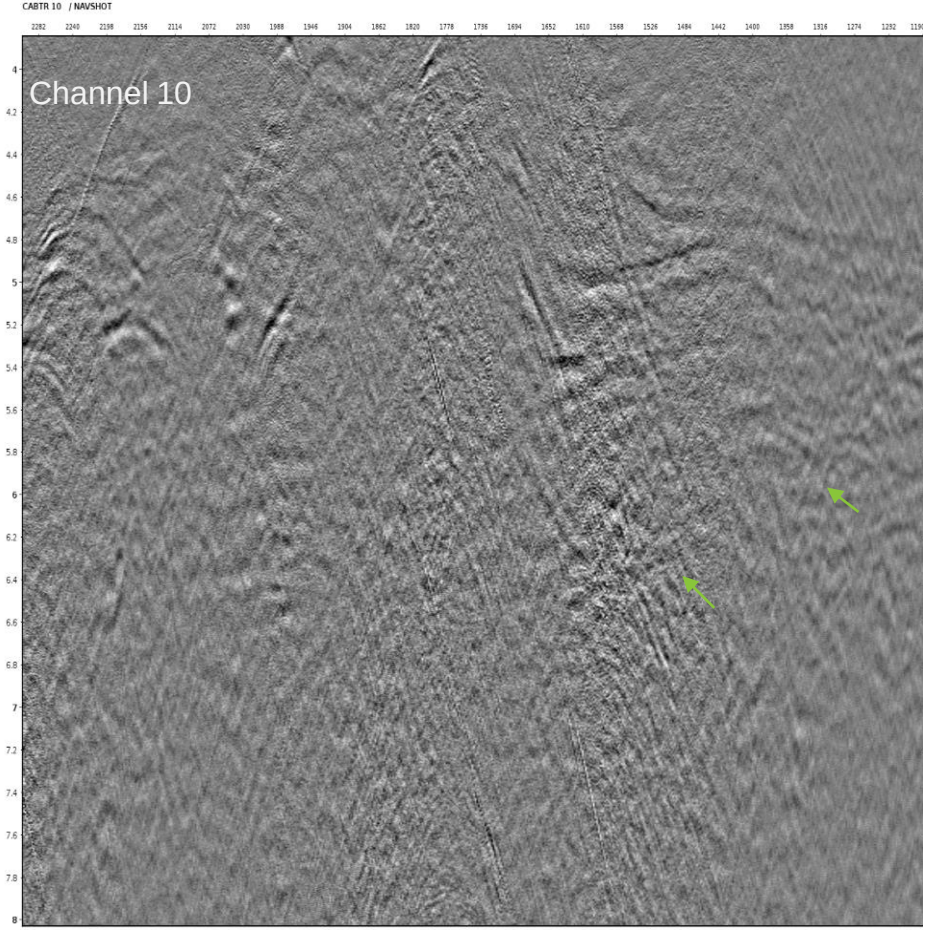
Common Channel after SRME Subtraction

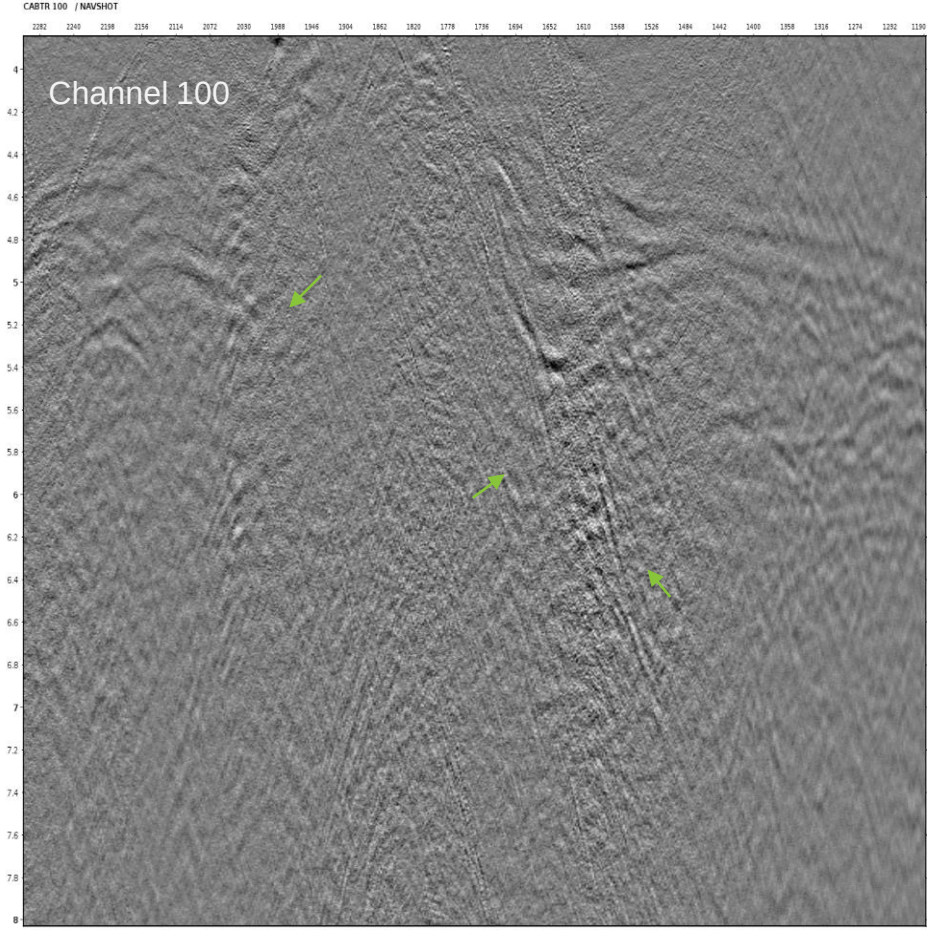




© 2020 CGG

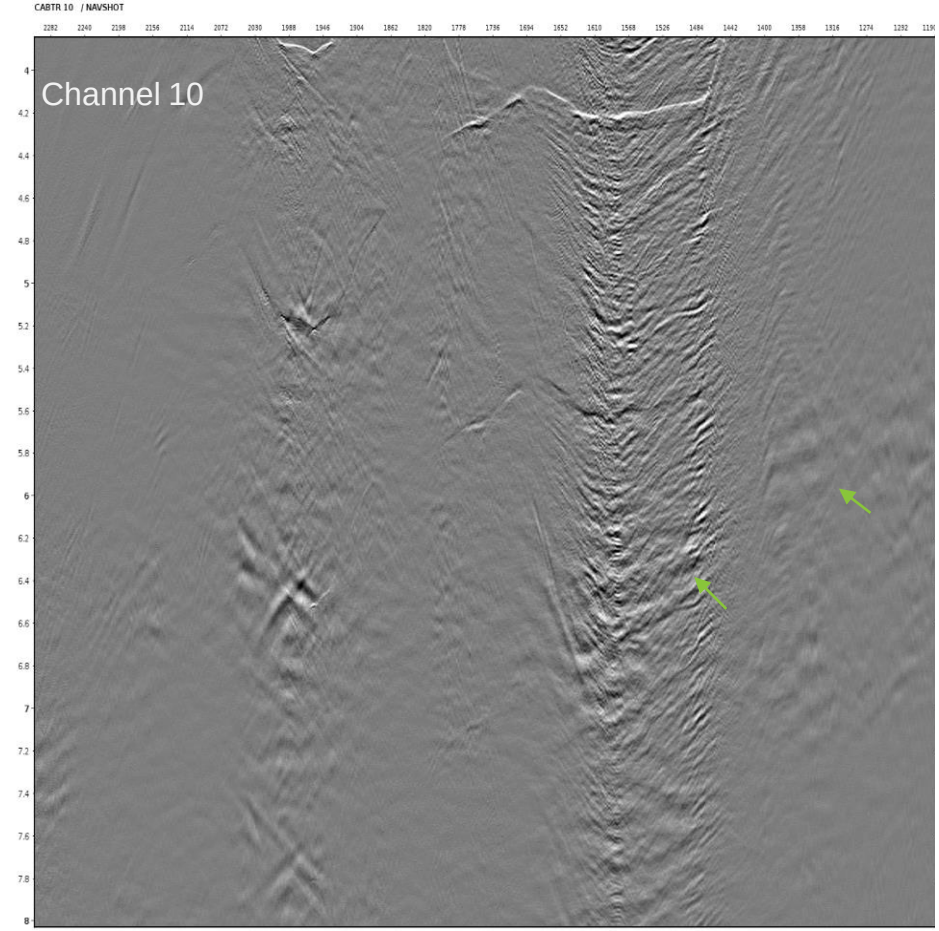
Common Channel after SRME & MWD Subtraction

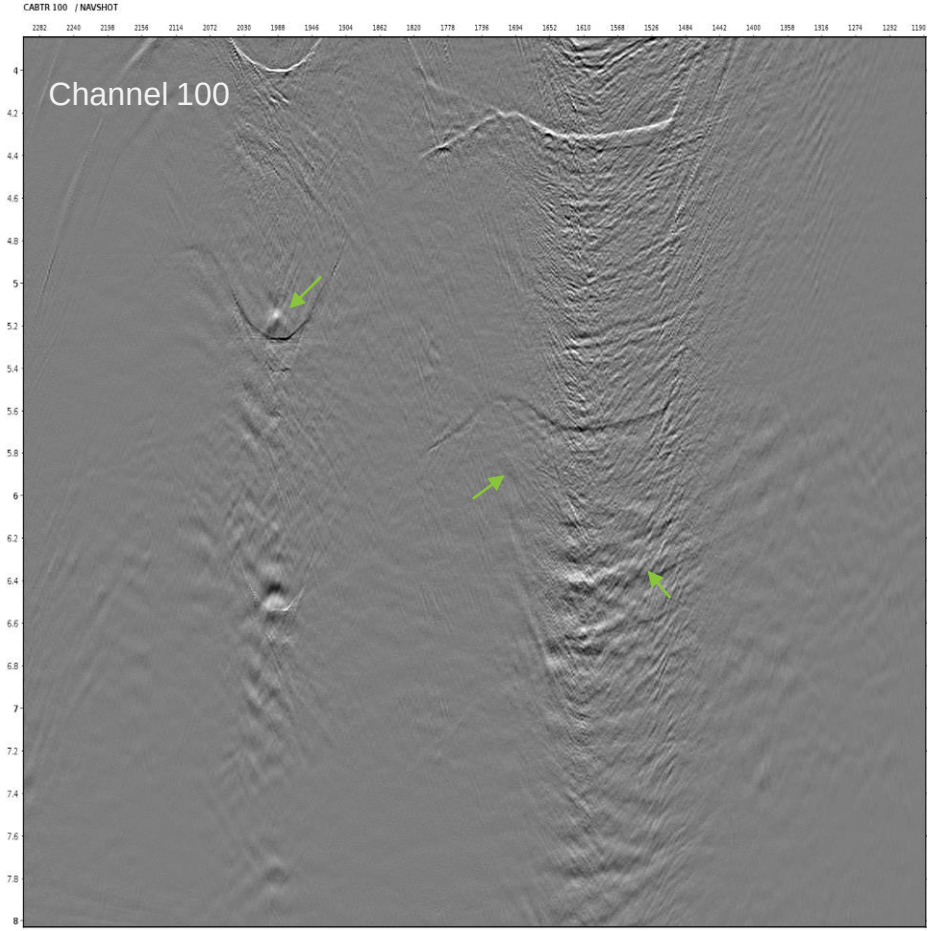




© 2020 CGG

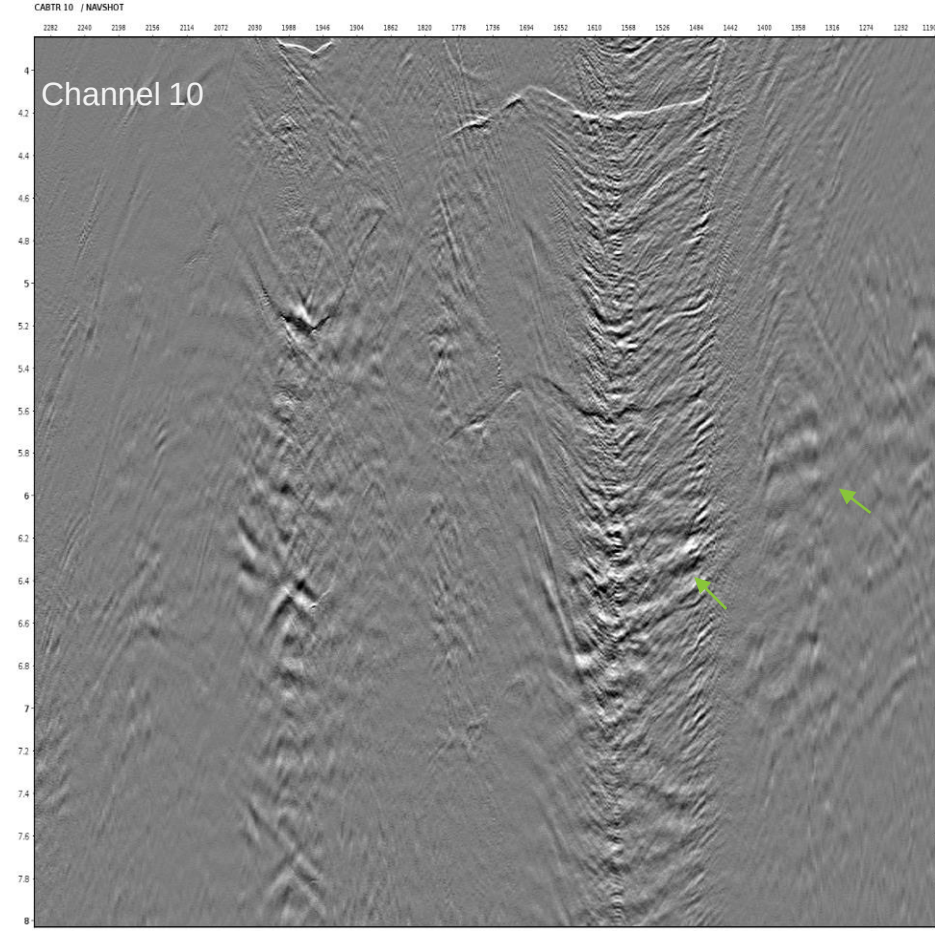
Difference before - after SRME Subtraction

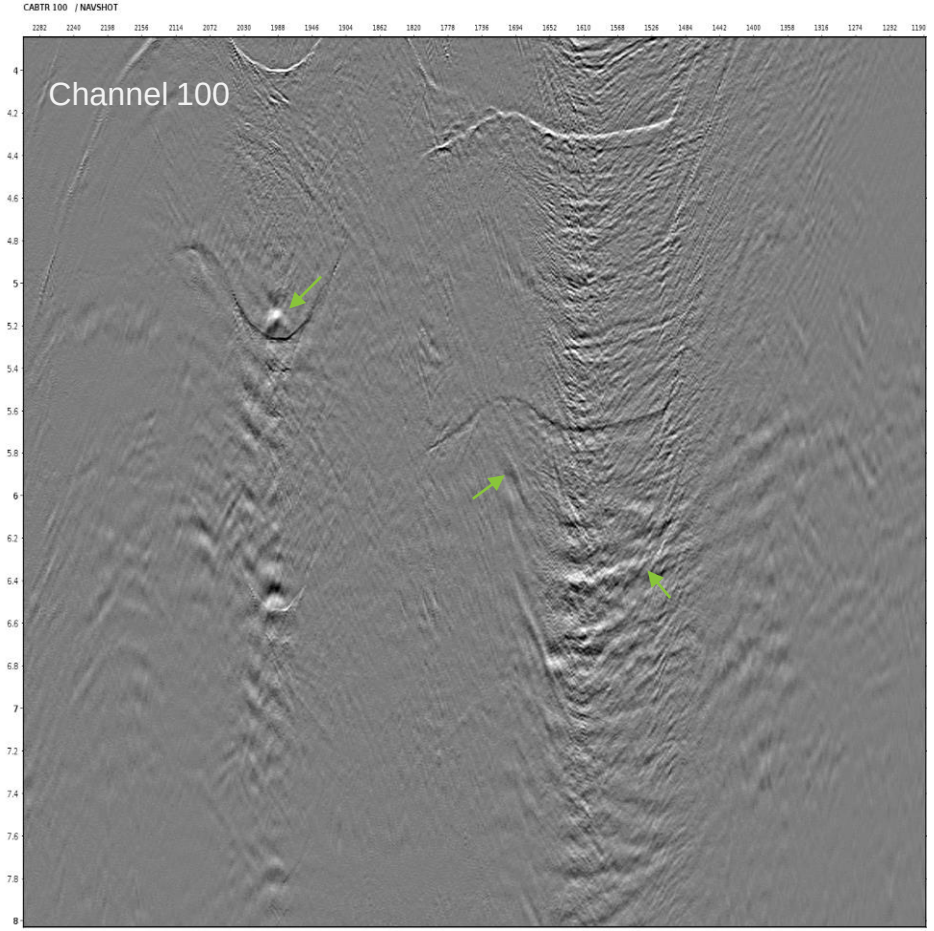




© 2020 CGG

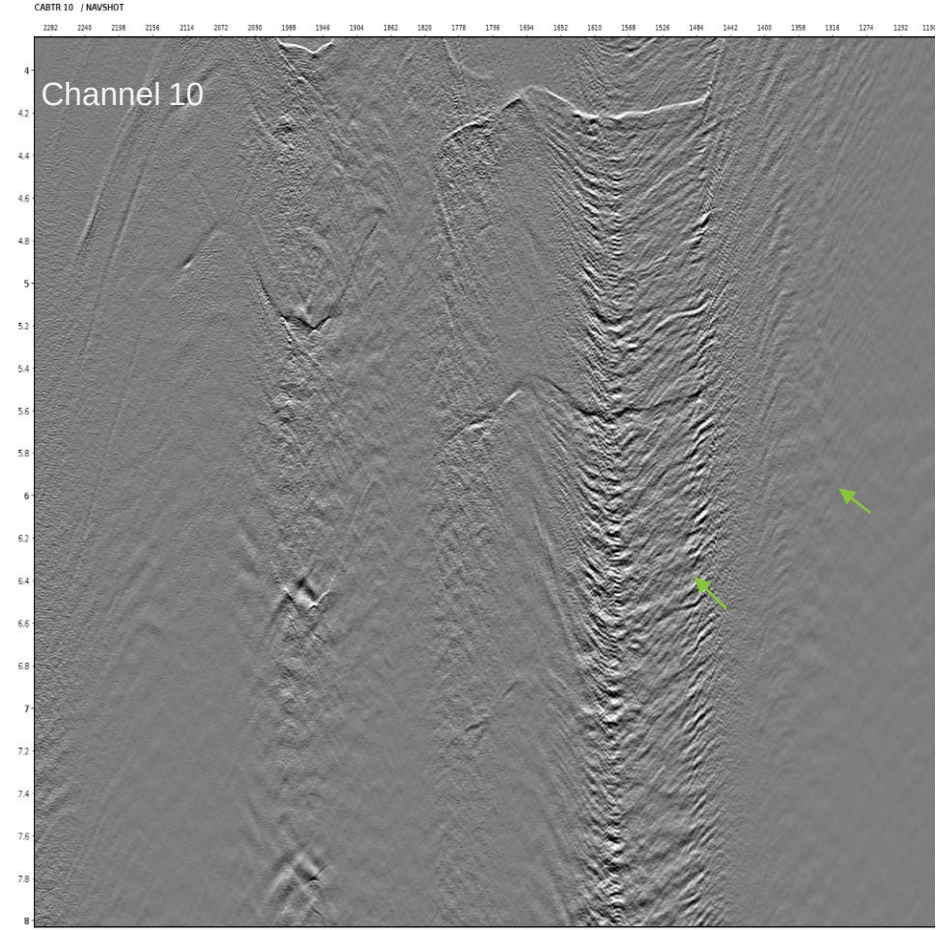
Difference before - after SRME & MWD Subtraction

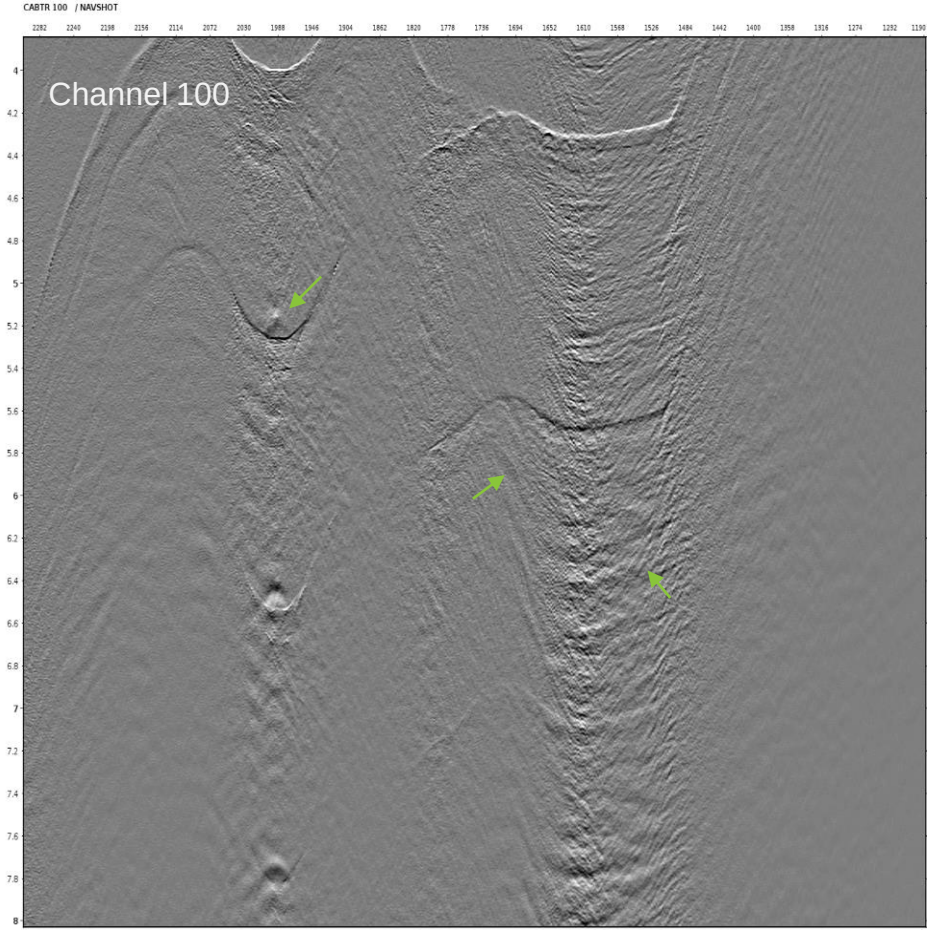




© 2020 CGG

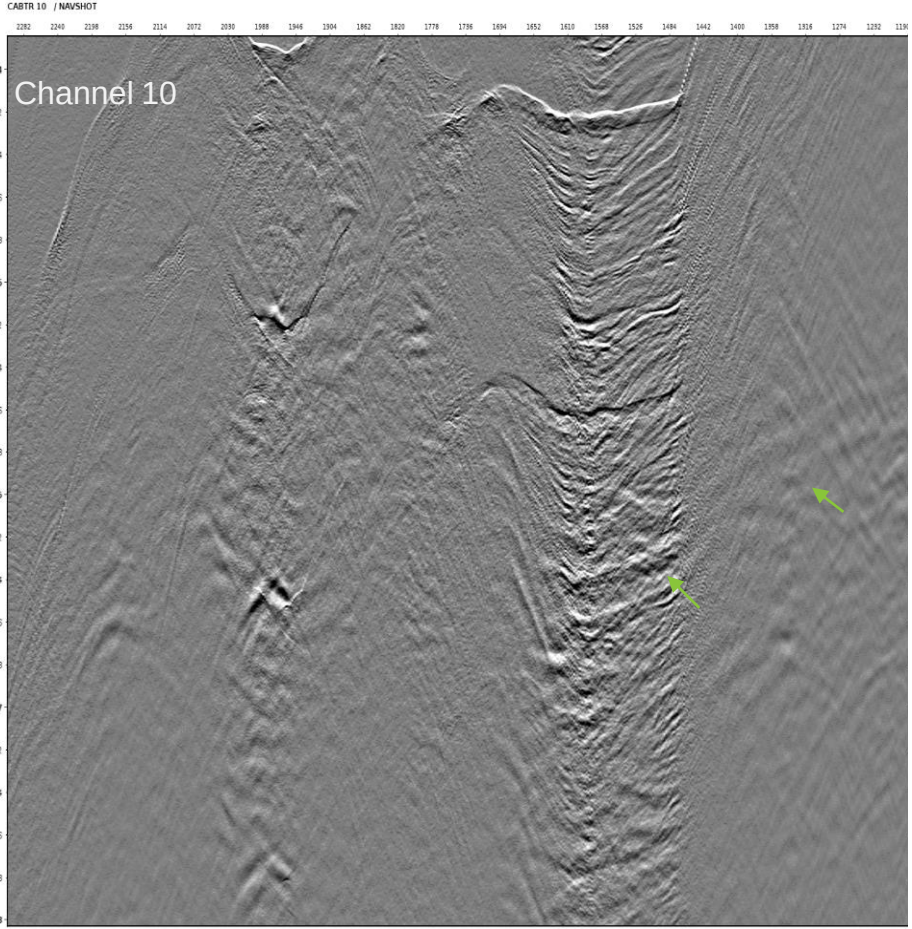
Common Channel SRME Model

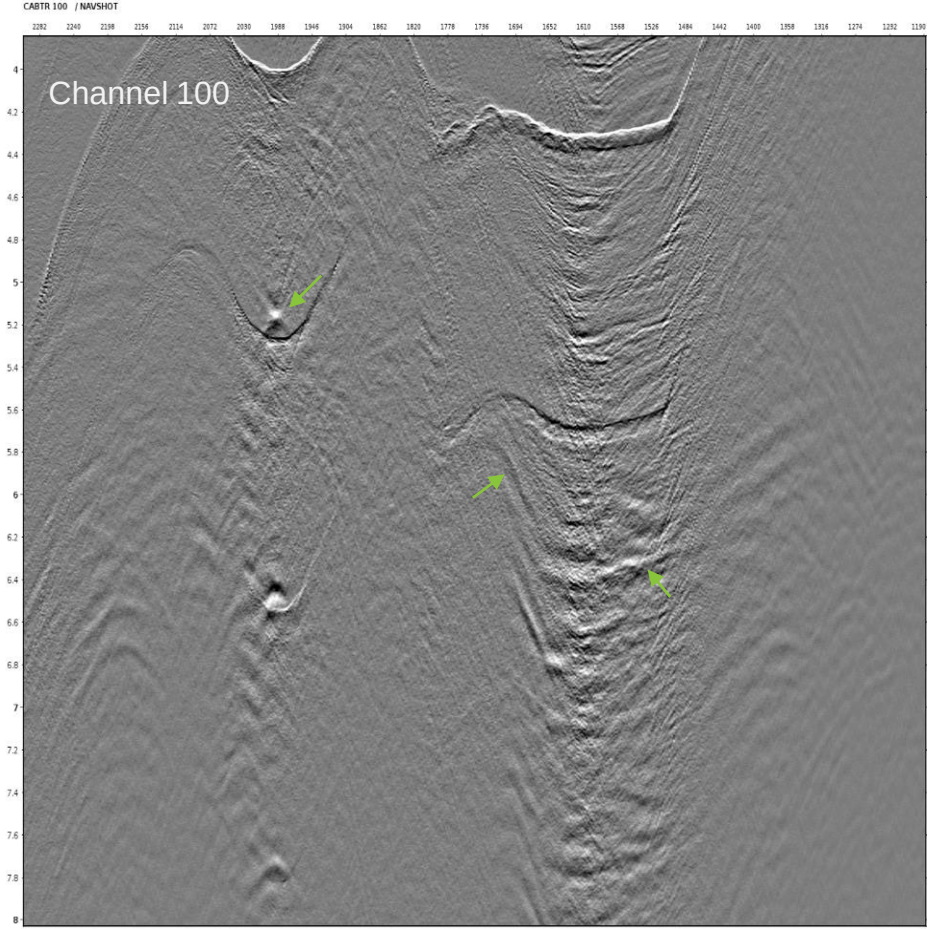




© 2020 CGG

Common Channel MWD Model





© 2020 CGG

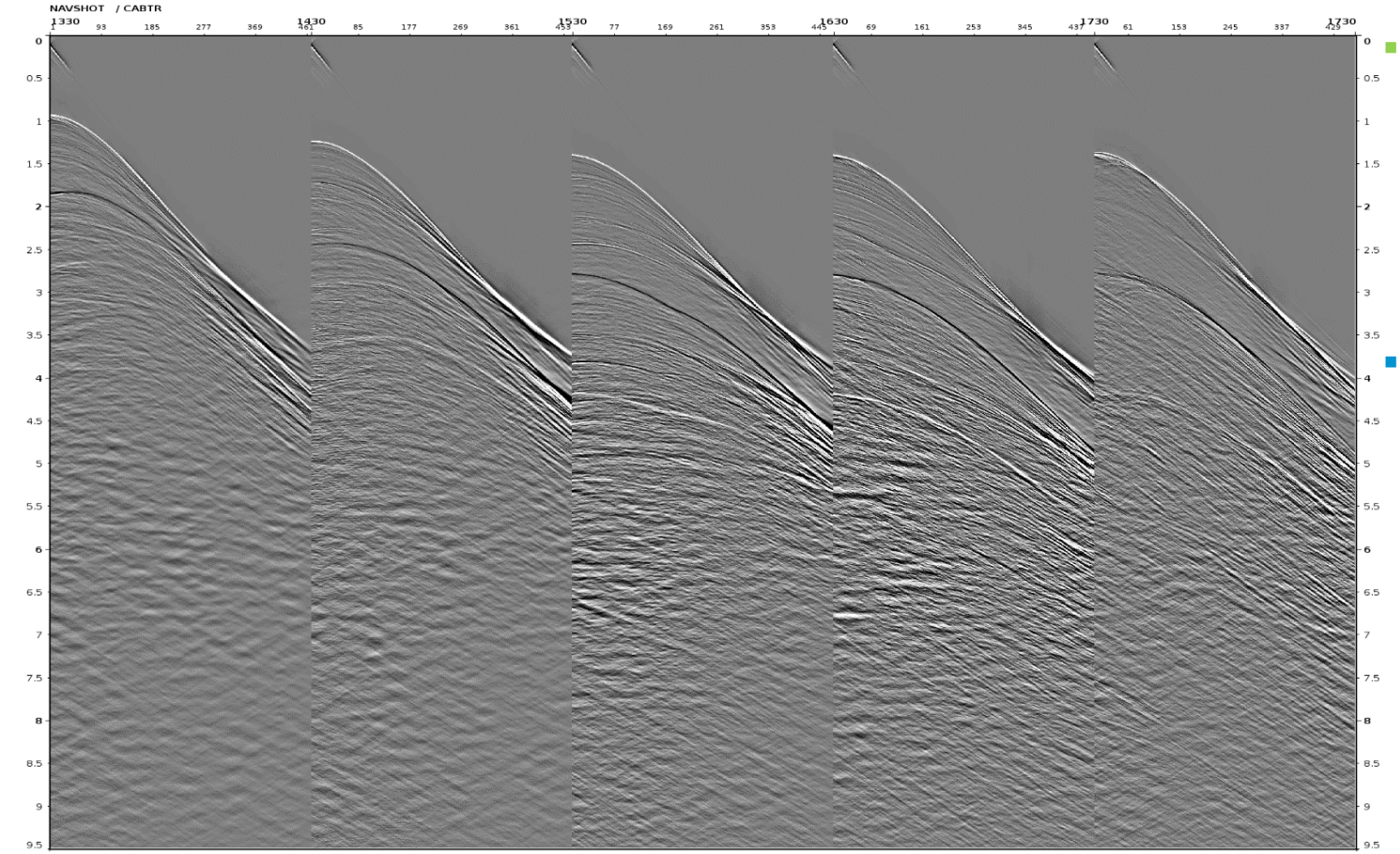
Seq 039

Stack

Common Channel

Shot Gathers

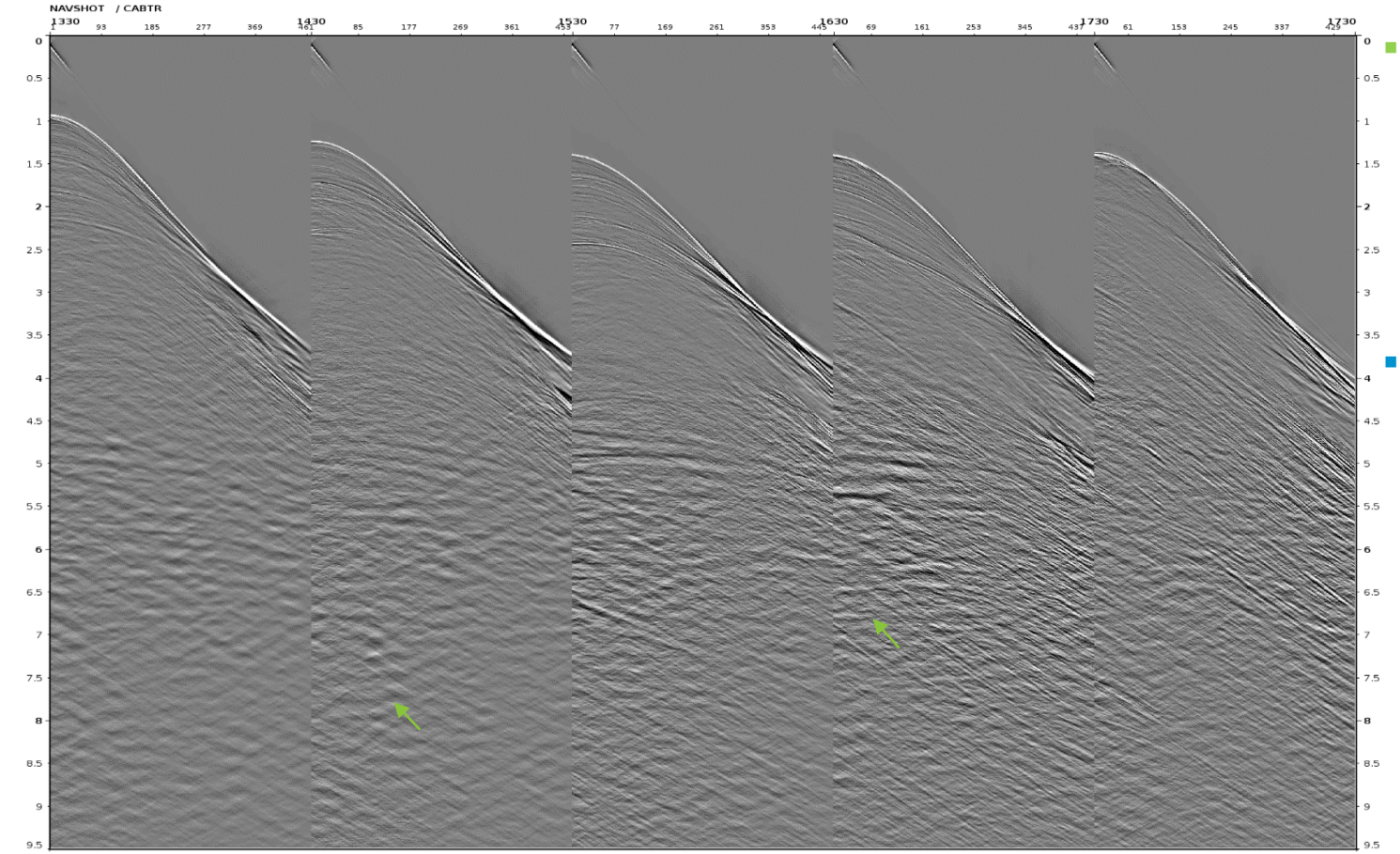
Selected Shots before Subtraction



- Simultaneous subtraction flow with MWD & SRME shows benefits in surface related multiples removal and primaries protection.
- Far offset dipping residual will be further removed by “Radon” and residual LNA (Linear noise attenuation).

© 2020 CGG

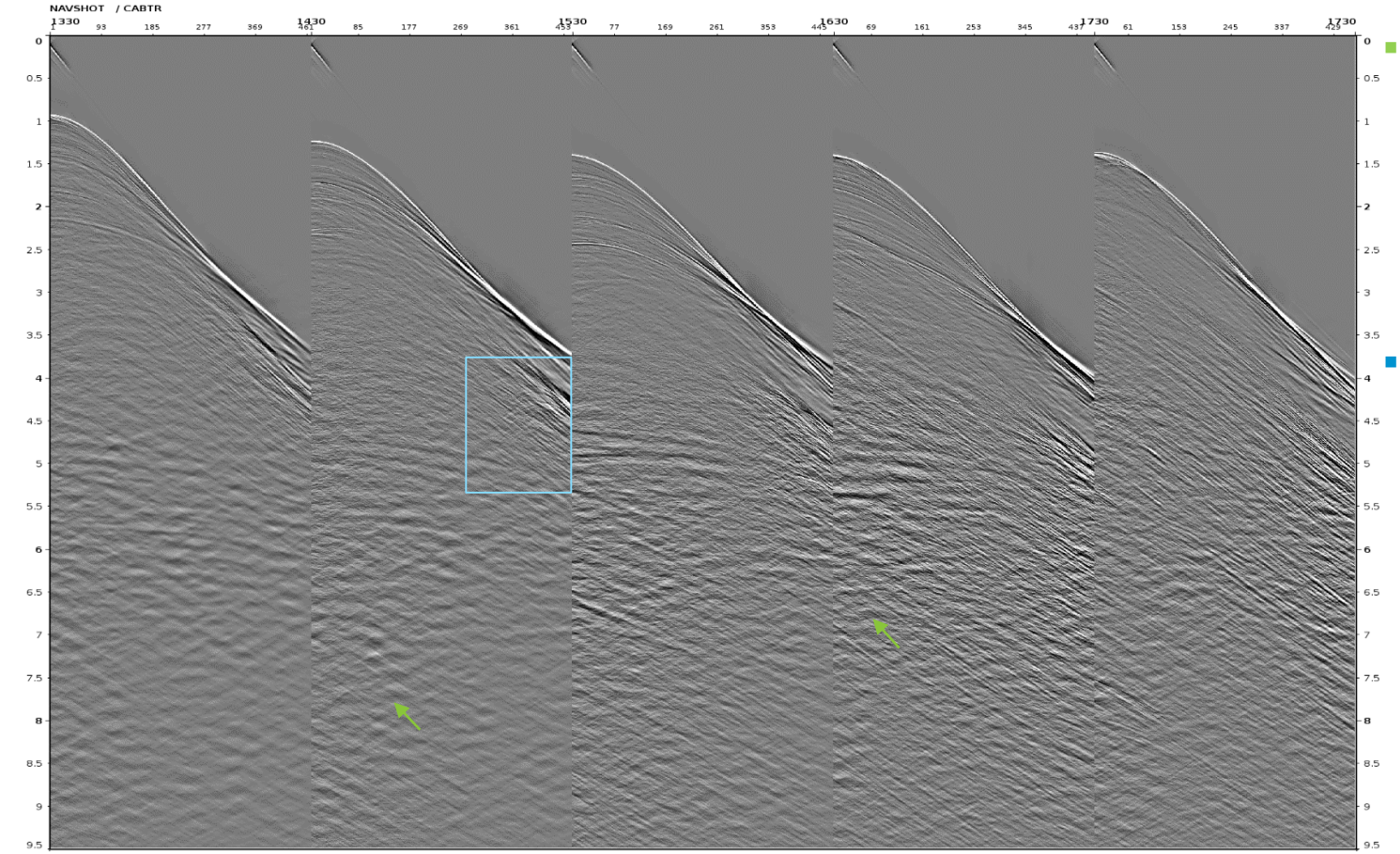
Selected Shots after SRME Subtraction



- Simultaneous subtraction flow with MWD & SRME shows benefits in surface related multiples removal and primaries protection.
- Far offset dipping residual will be further removed by “Radon” and residual LNA (Linear noise attenuation).

© 2020 CGG

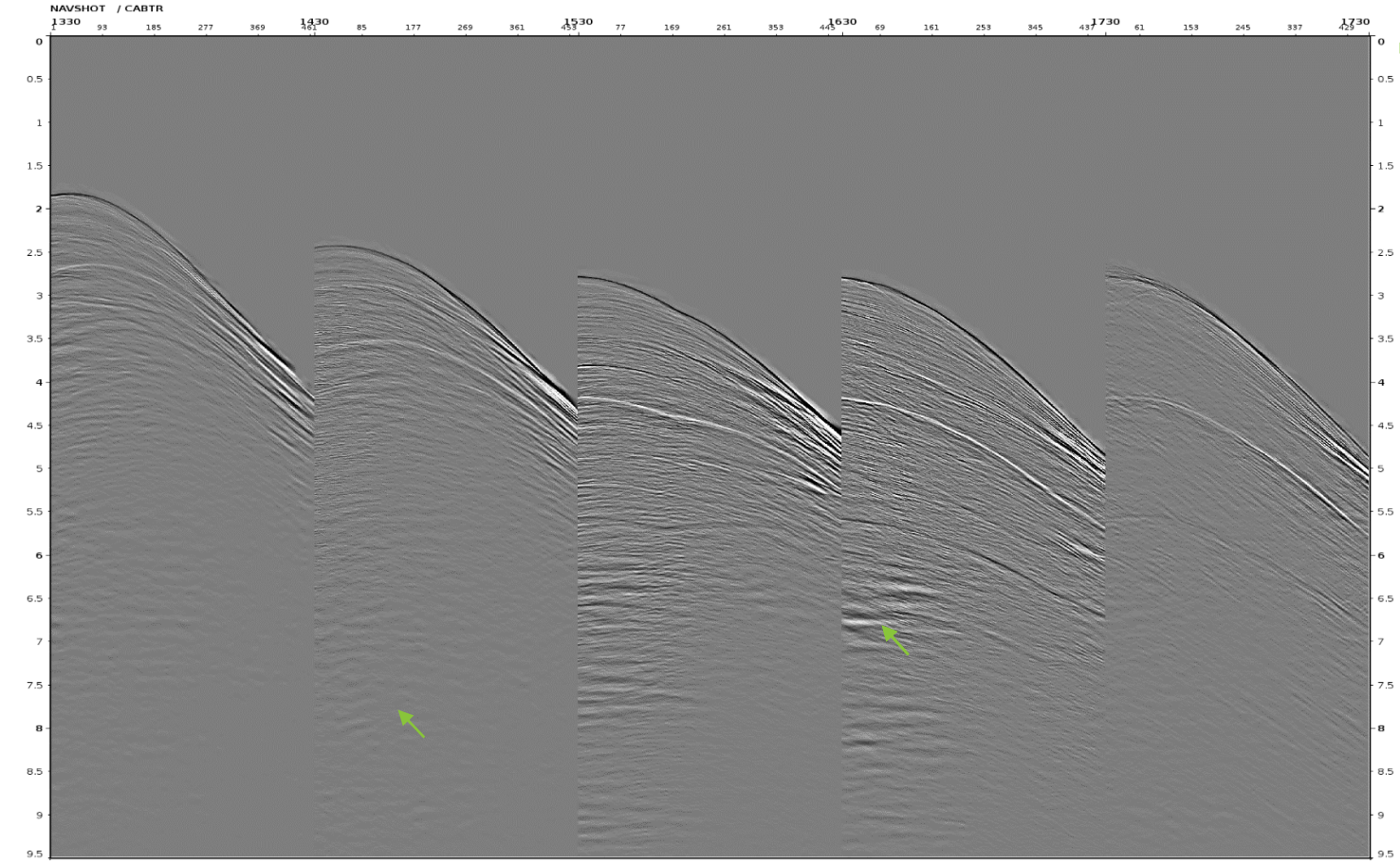
Selected Shots after SRME & MWD Subtraction



- Simultaneous subtraction flow with MWD & SRME shows benefits in surface related multiples removal and primaries protection.
- Far offset dipping residual will be further removed by “Radon” and residual LNA (Linear noise attenuation).

© 2020 CGG

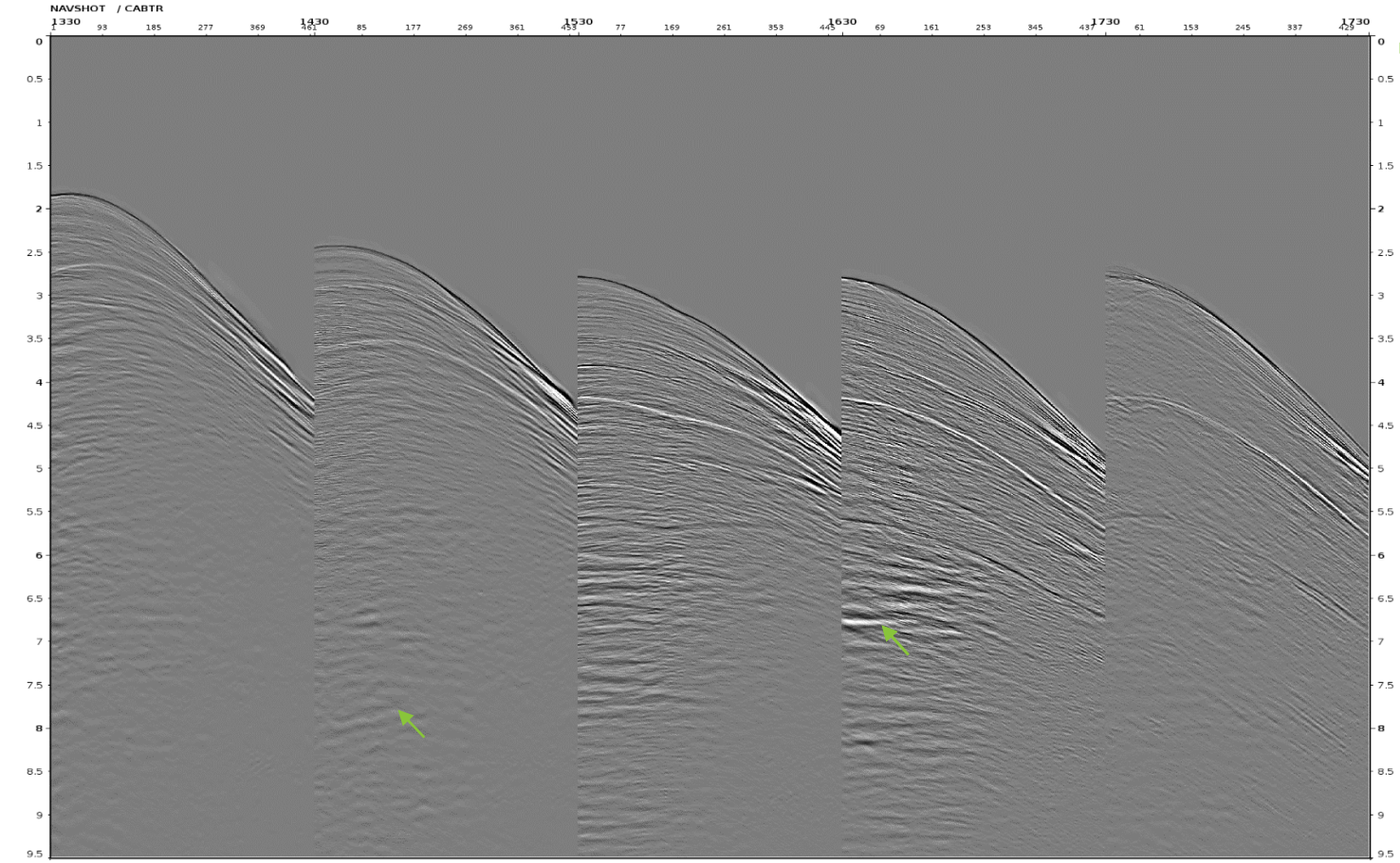
Difference before - after SRME Subtraction



- Simultaneous subtraction flow with MWD & SRME shows benefits in surface related multiples removal and primaries protection.

© 2020 CGG

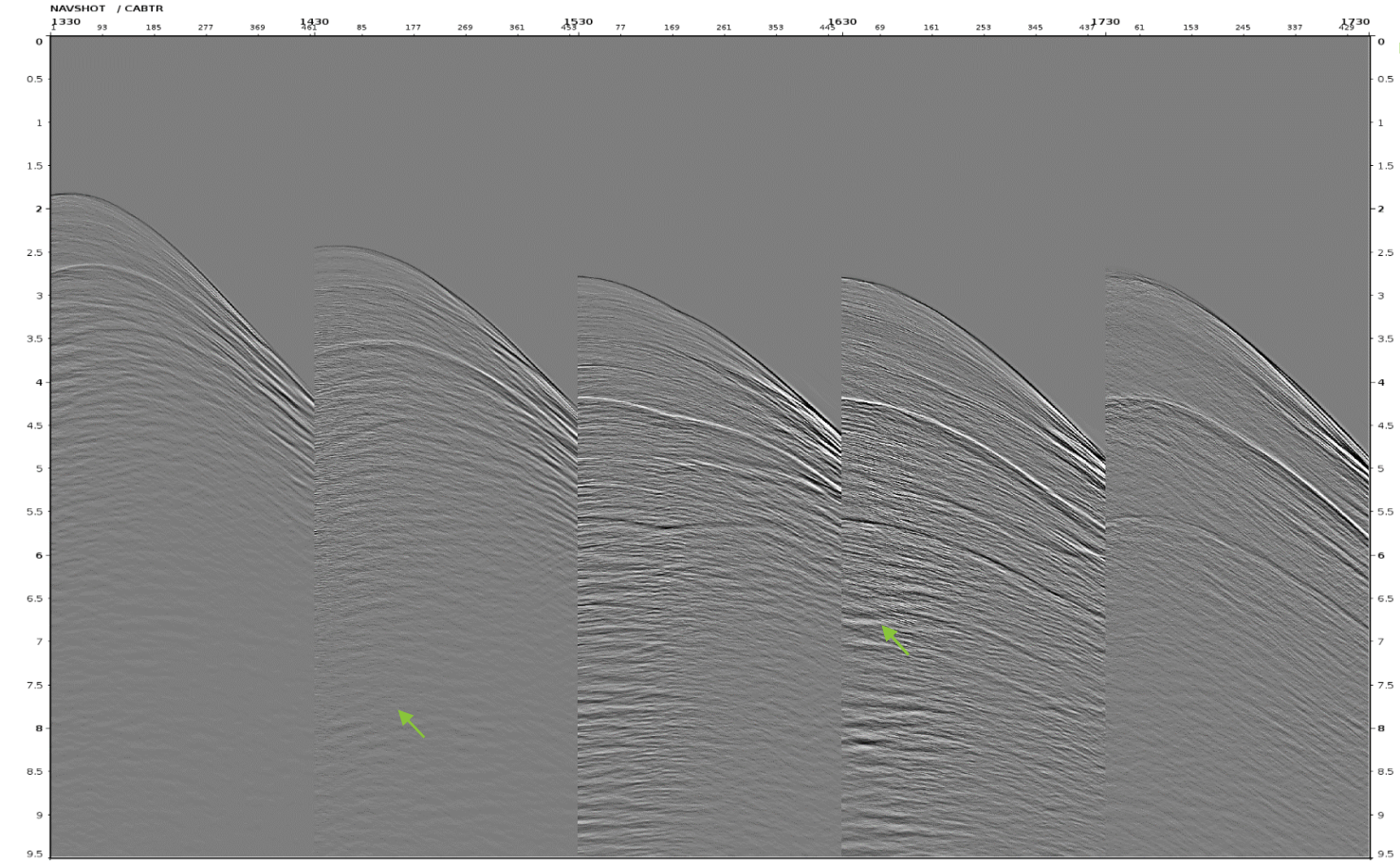
Difference before - after SRME & MWD Subtraction



- Simultaneous subtraction flow with MWD & SRME shows benefits in surface related multiples removal and primaries protection.

© 2020 CGG

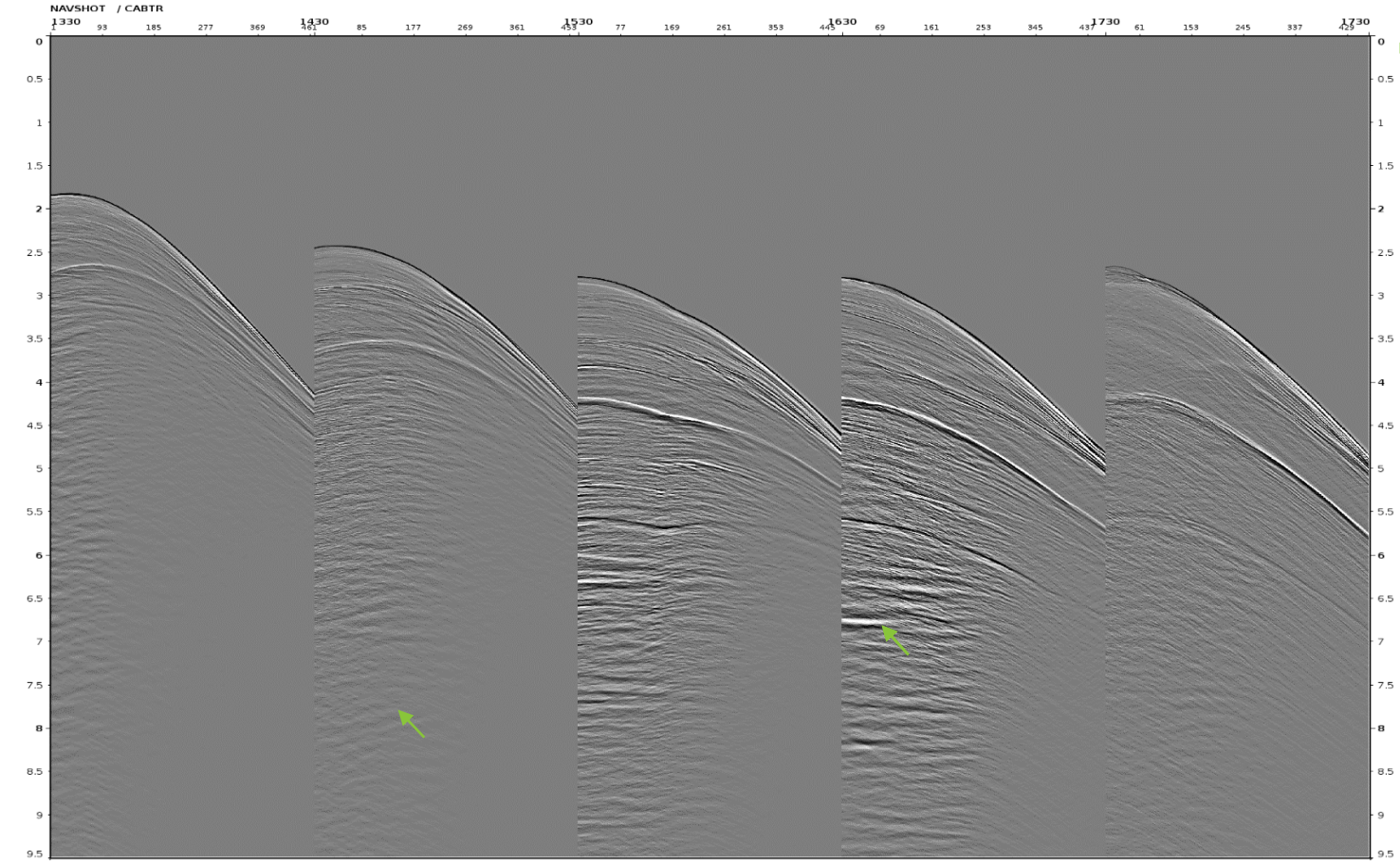
Selected Shots SRME Model



- Simultaneous subtraction flow with MWD & SRME shows benefits in surface related multiples removal and primaries protection.

© 2020 CGG

Selected Shots MWD Model



- Simultaneous subtraction flow with MWD & SRME shows benefits in surface related multiples removal and primaries protection.

© 2020 CGG

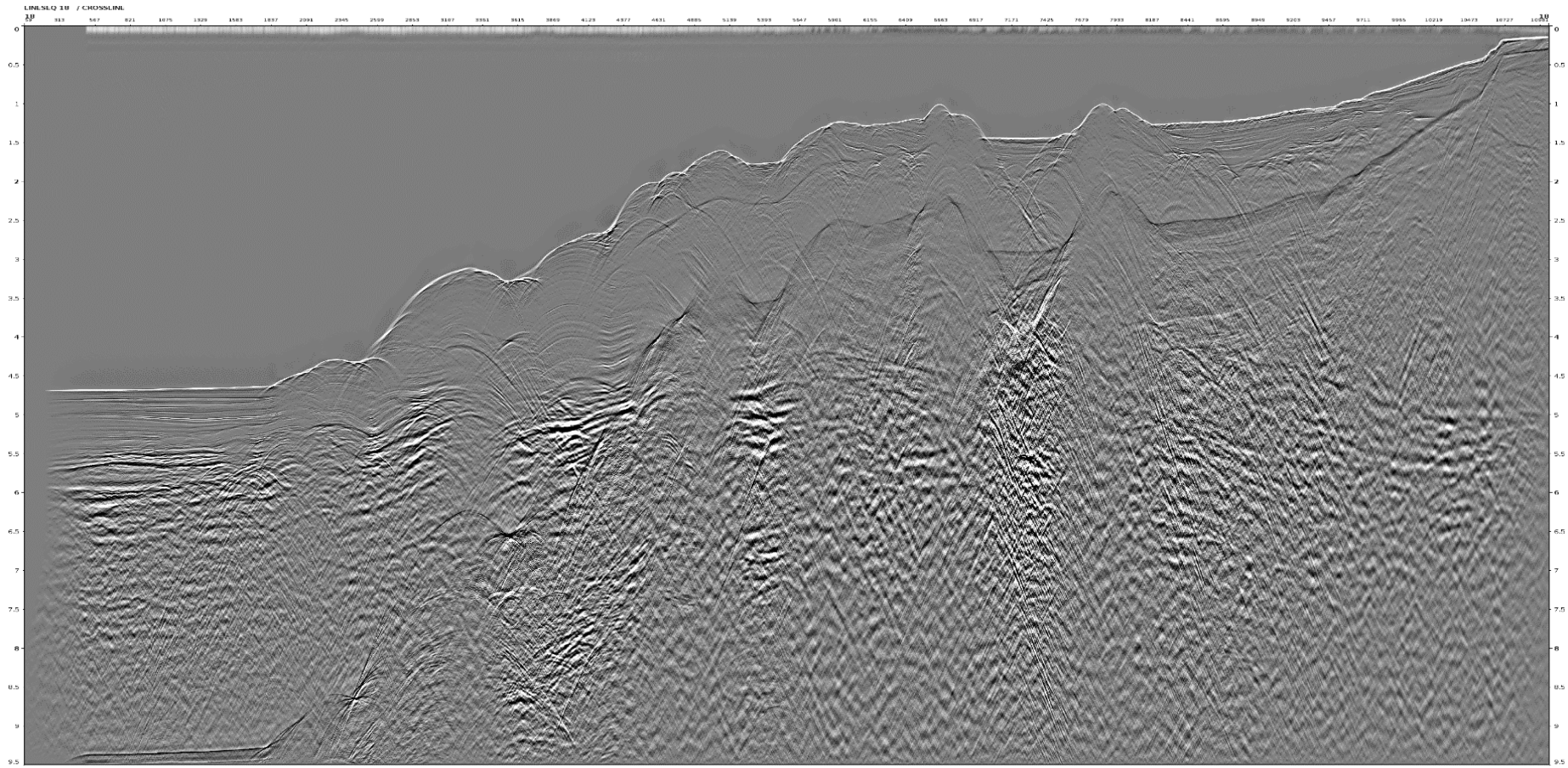
Seq 018

Stack

Common Channel

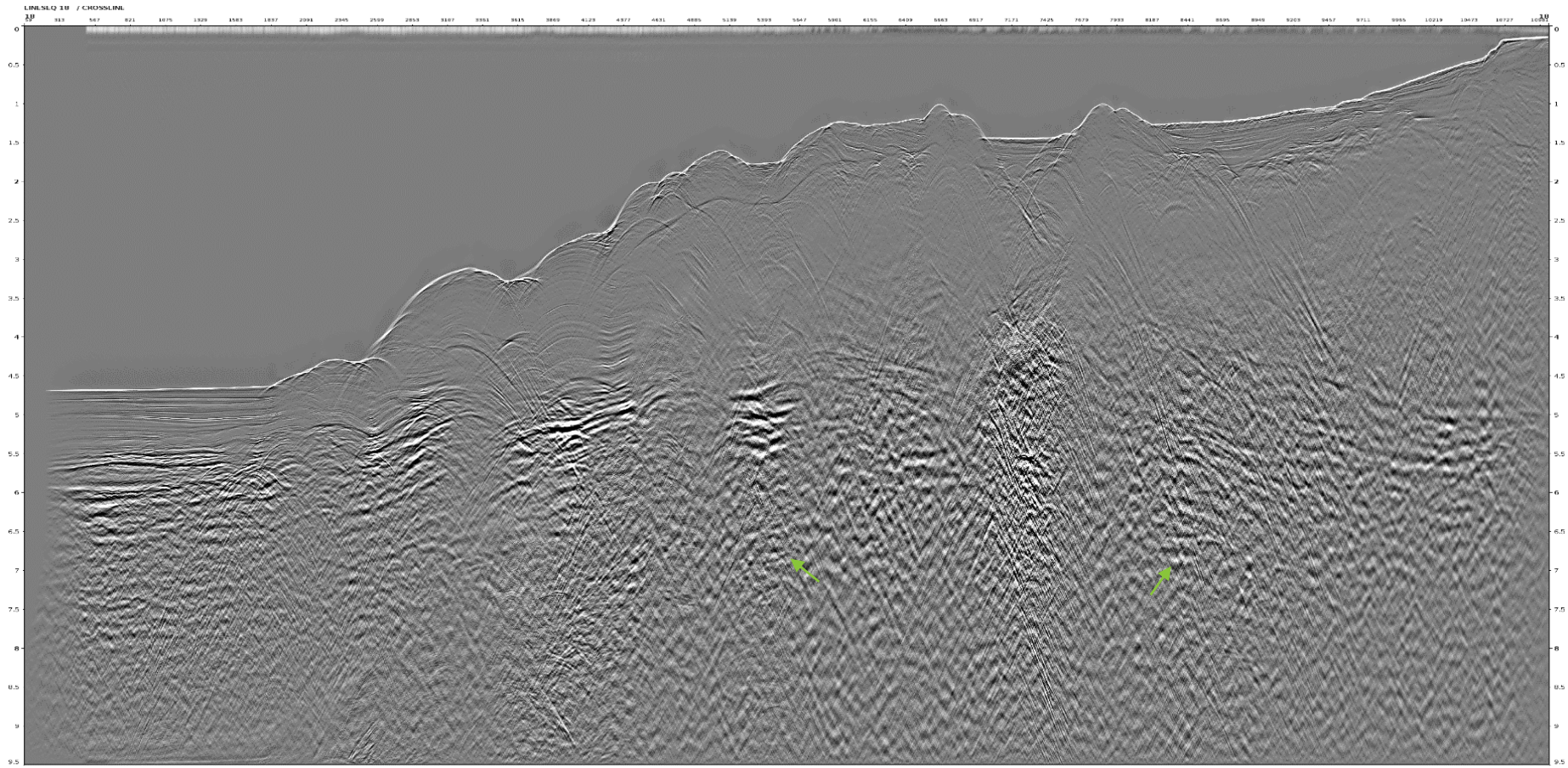
Shot Gathers

Stack before Subtraction



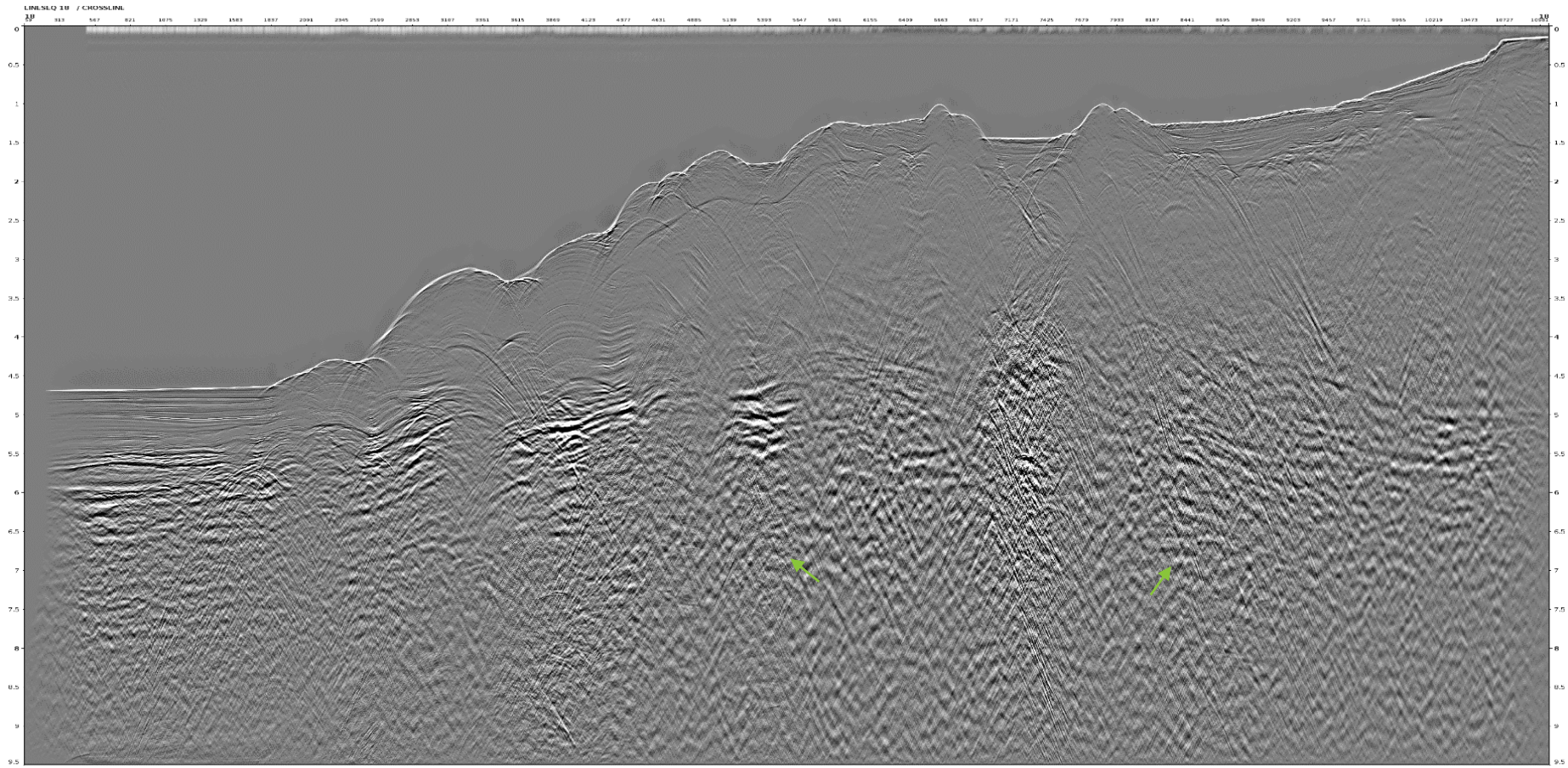
© 2020 CGG

Stack after SRME Subtraction



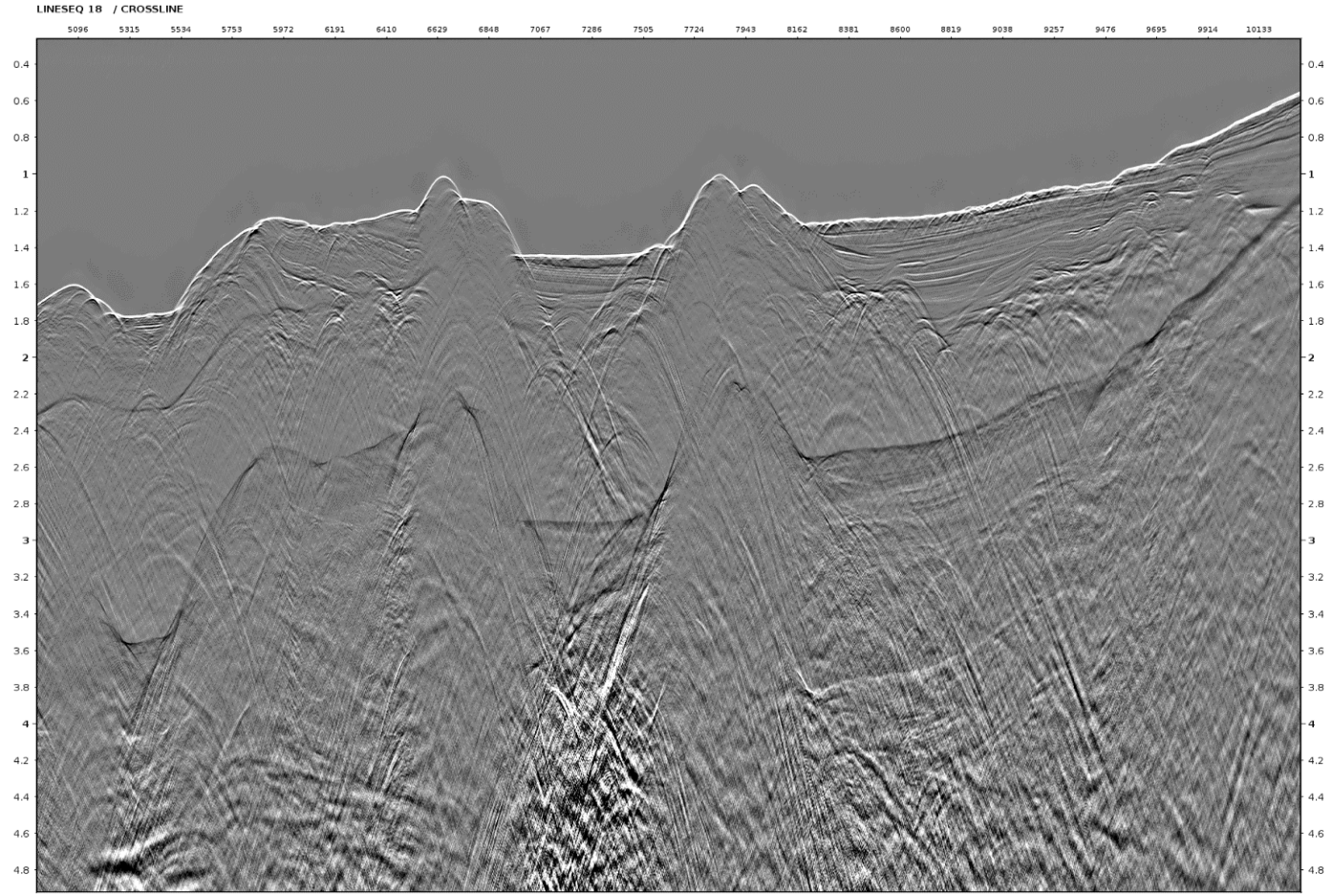
© 2020 CGG

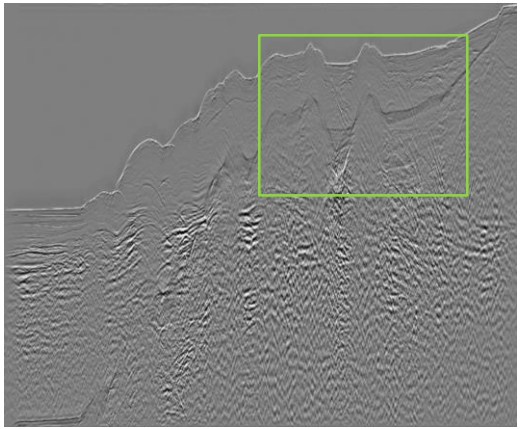
Stack after SRME & MWD Subtraction



© 2020 CGG

Zoom in Stack before Subtraction

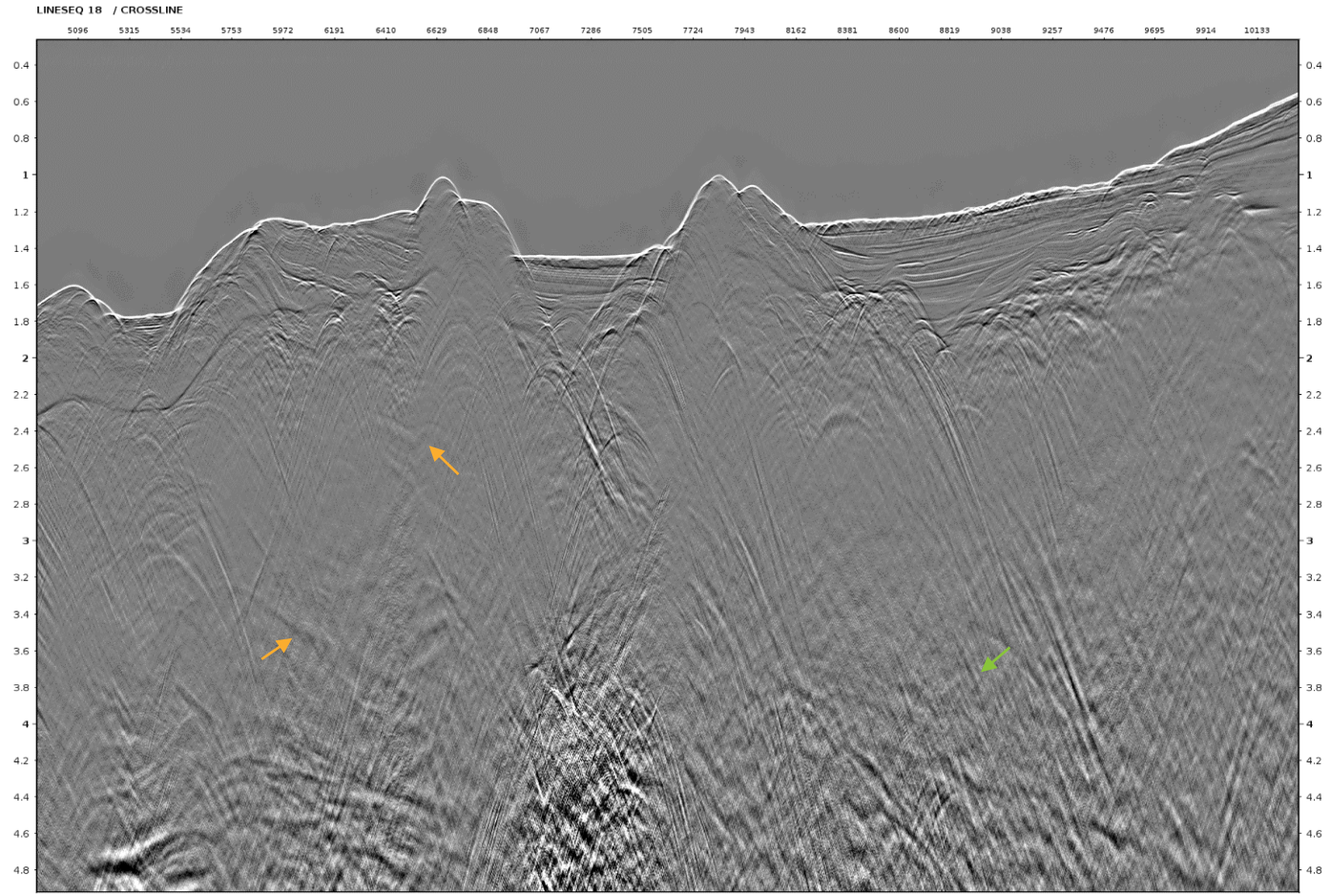


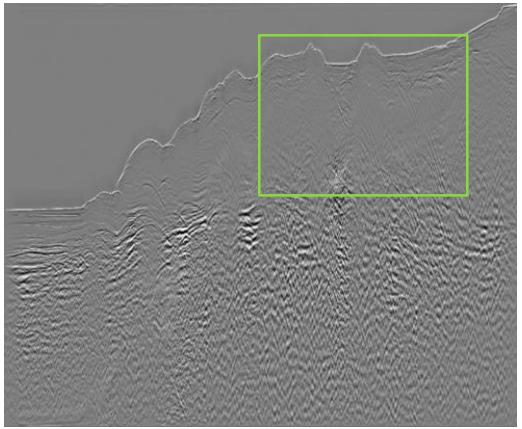


- Multiples are better attenuated with simultaneous subtraction.
- Primaries are protected by simultaneous subtraction flow.

© 2020 CGG

Zoom in Stack after SRME Subtraction

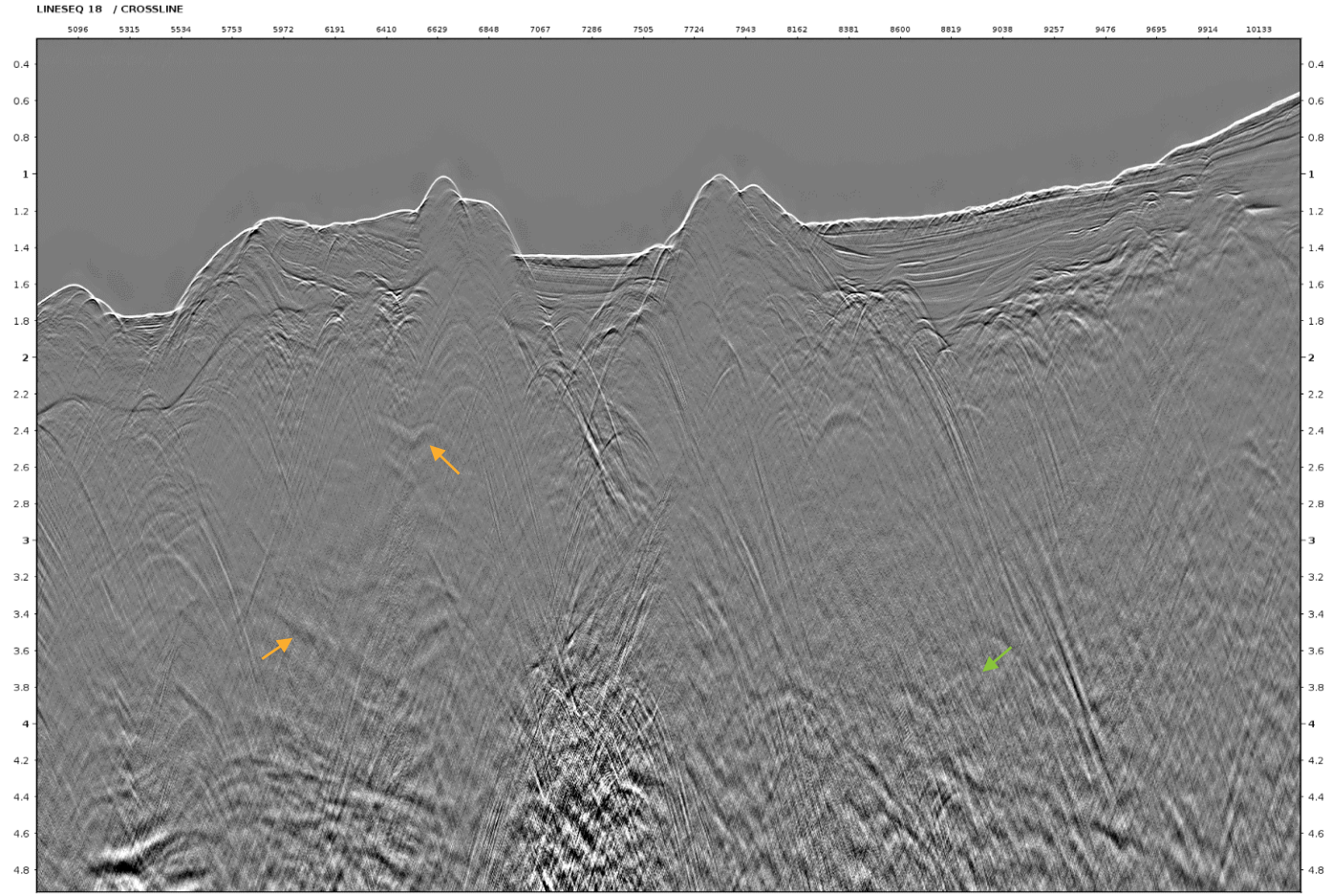


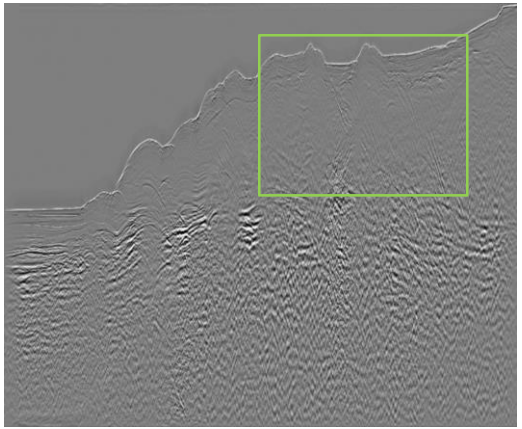


- Multiples are better attenuated with simultaneous subtraction.
- Primaries are protected by simultaneous subtraction flow.

© 2020 CGG

Zoom in Stack after SRME & MWD Subtraction

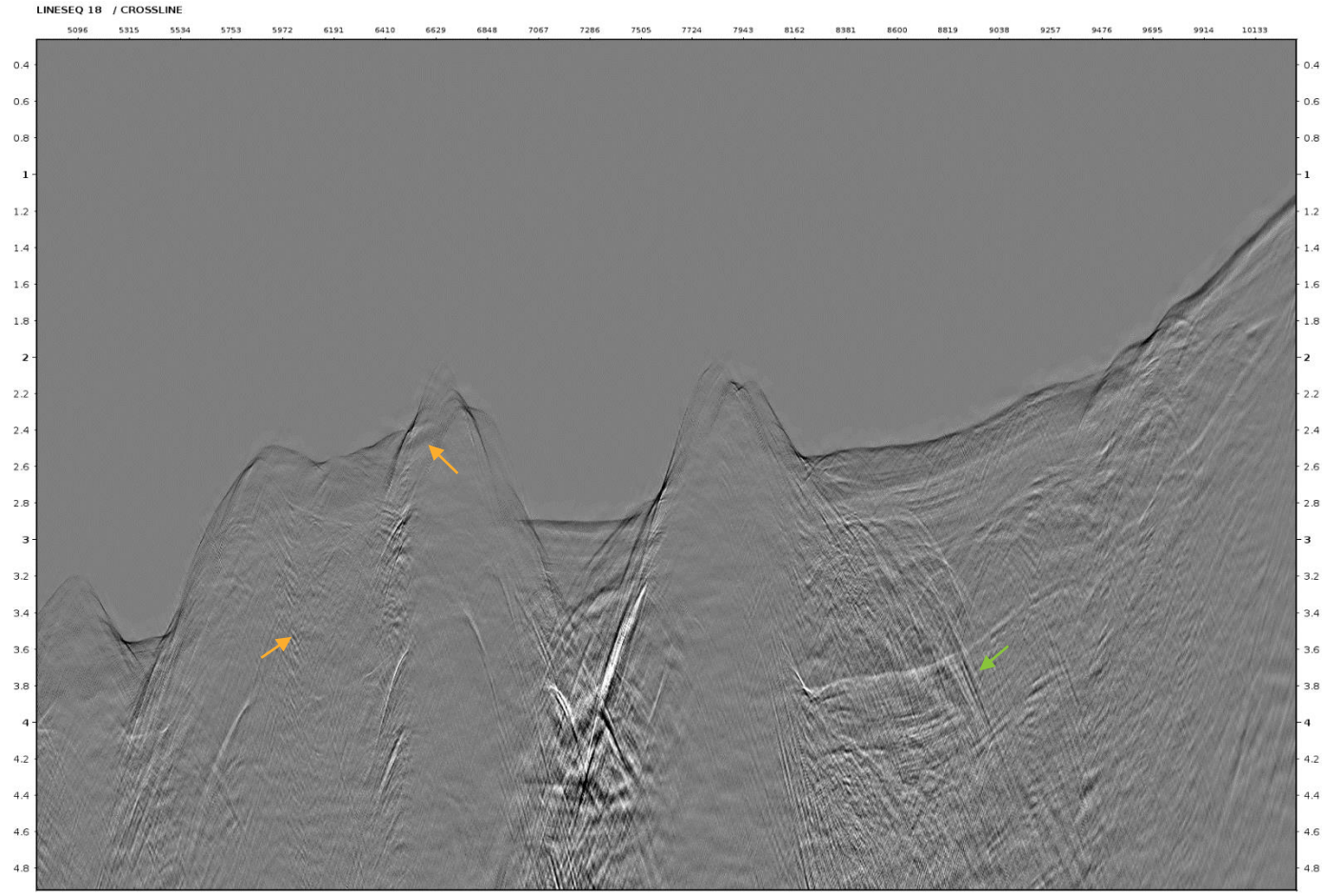




- Multiples are better attenuated with simultaneous subtraction.
- Primaries are protected by simultaneous subtraction flow.

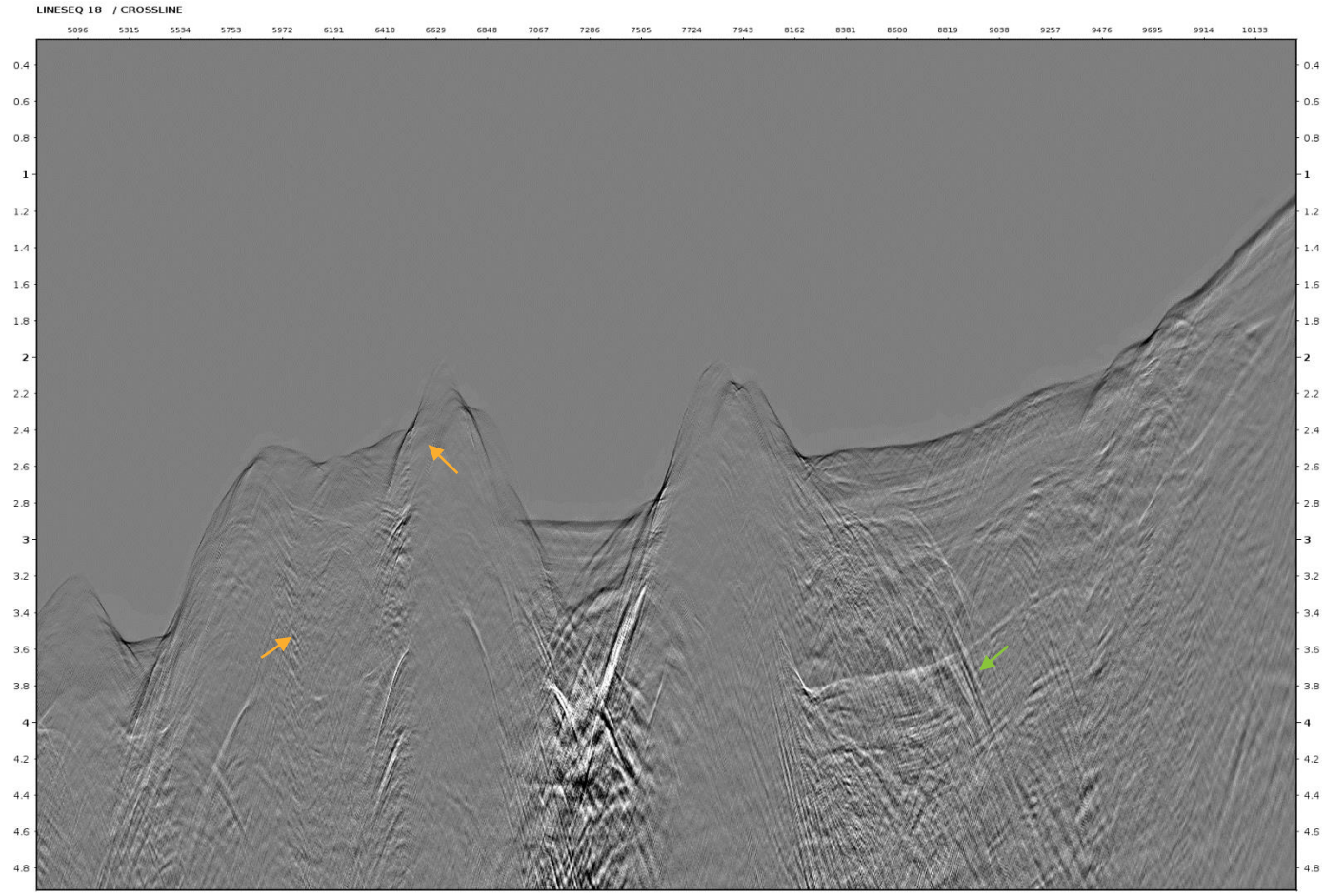
© 2020 CGG

Difference before – after SRME Subtraction



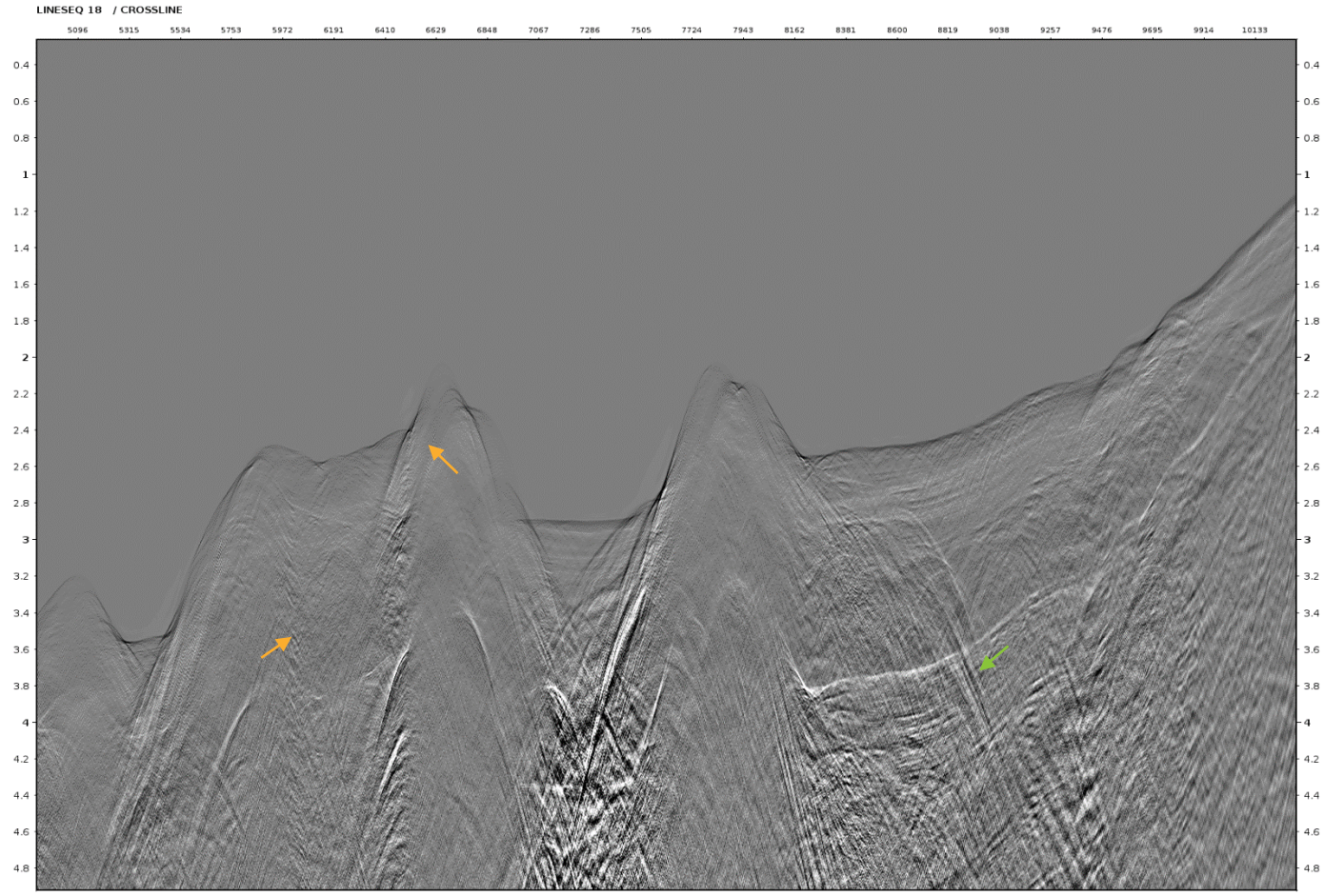
© 2020 CGG

Difference before – after SRME & MWD Subtraction



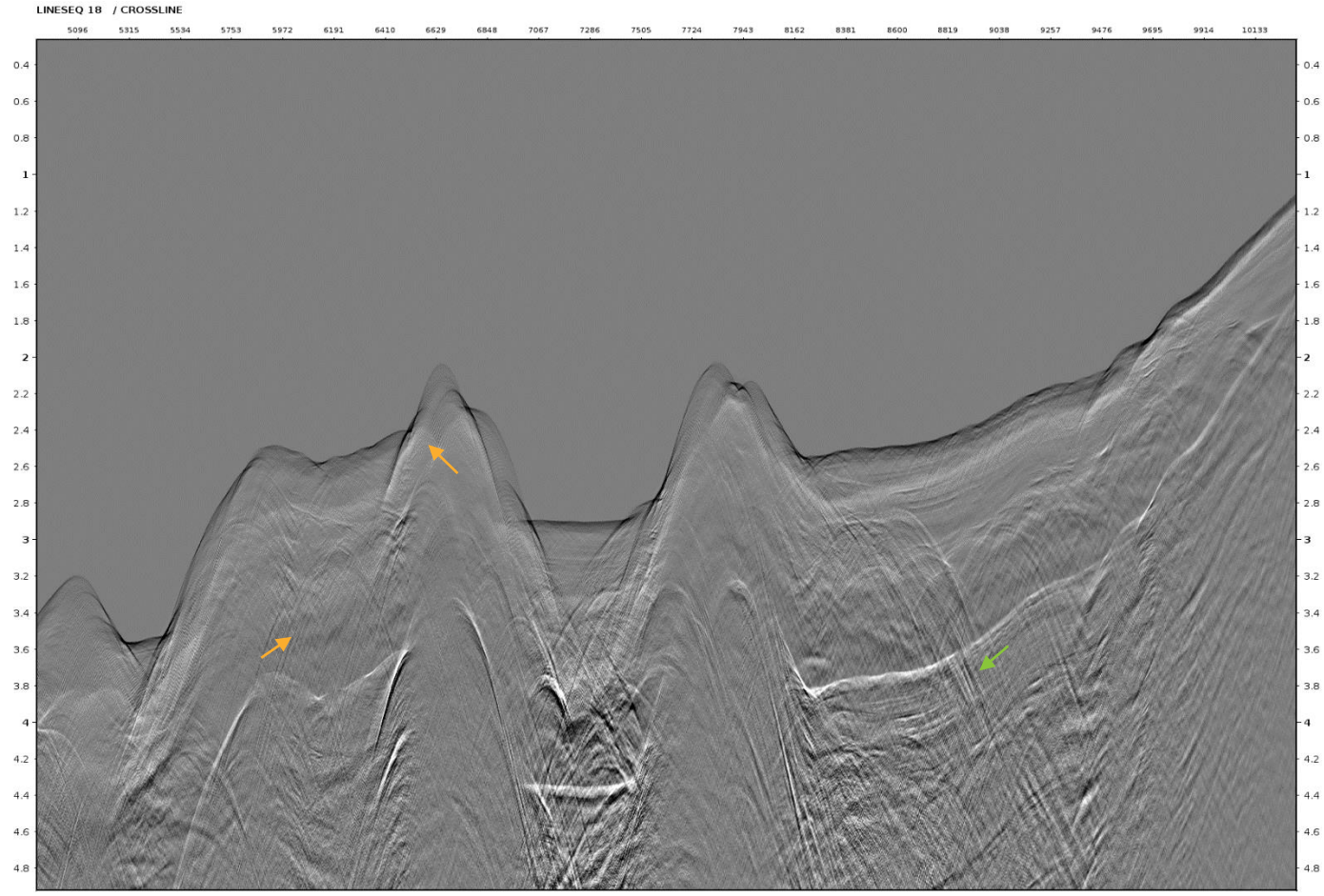
© 2020 CGG

Zoom in Stack – SRME Model



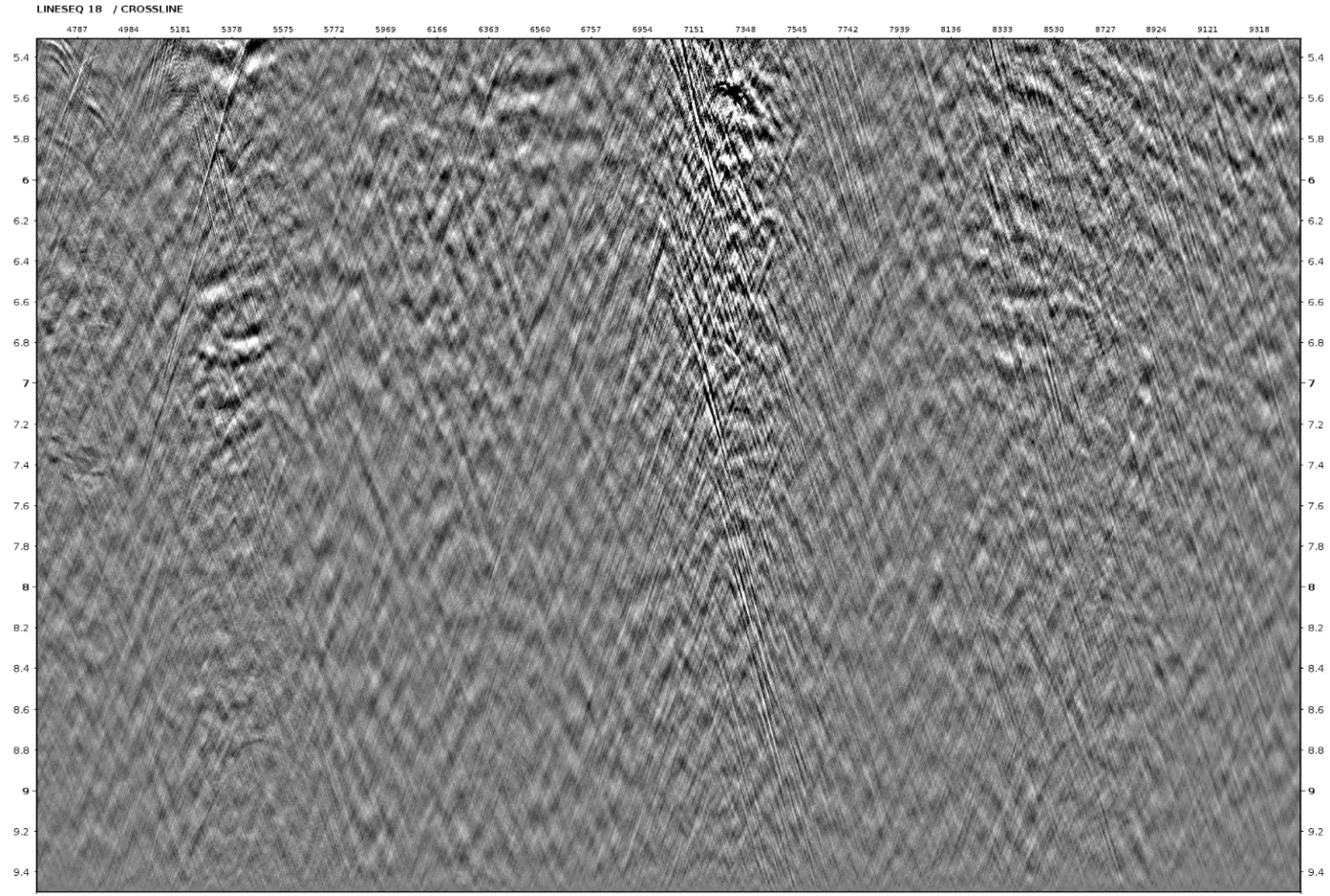
© 2020 CGG

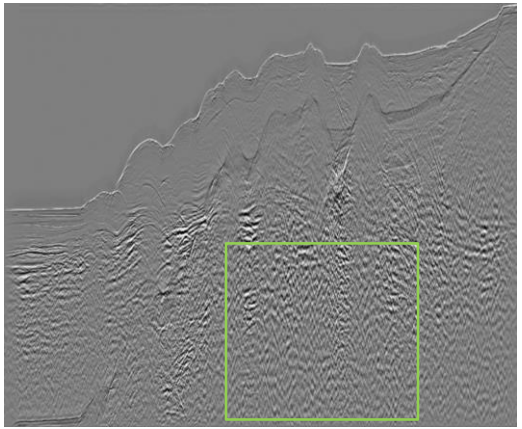
Zoom in Stack – MWD Model



© 2020 CGG

Zoom in Stack before Subtraction

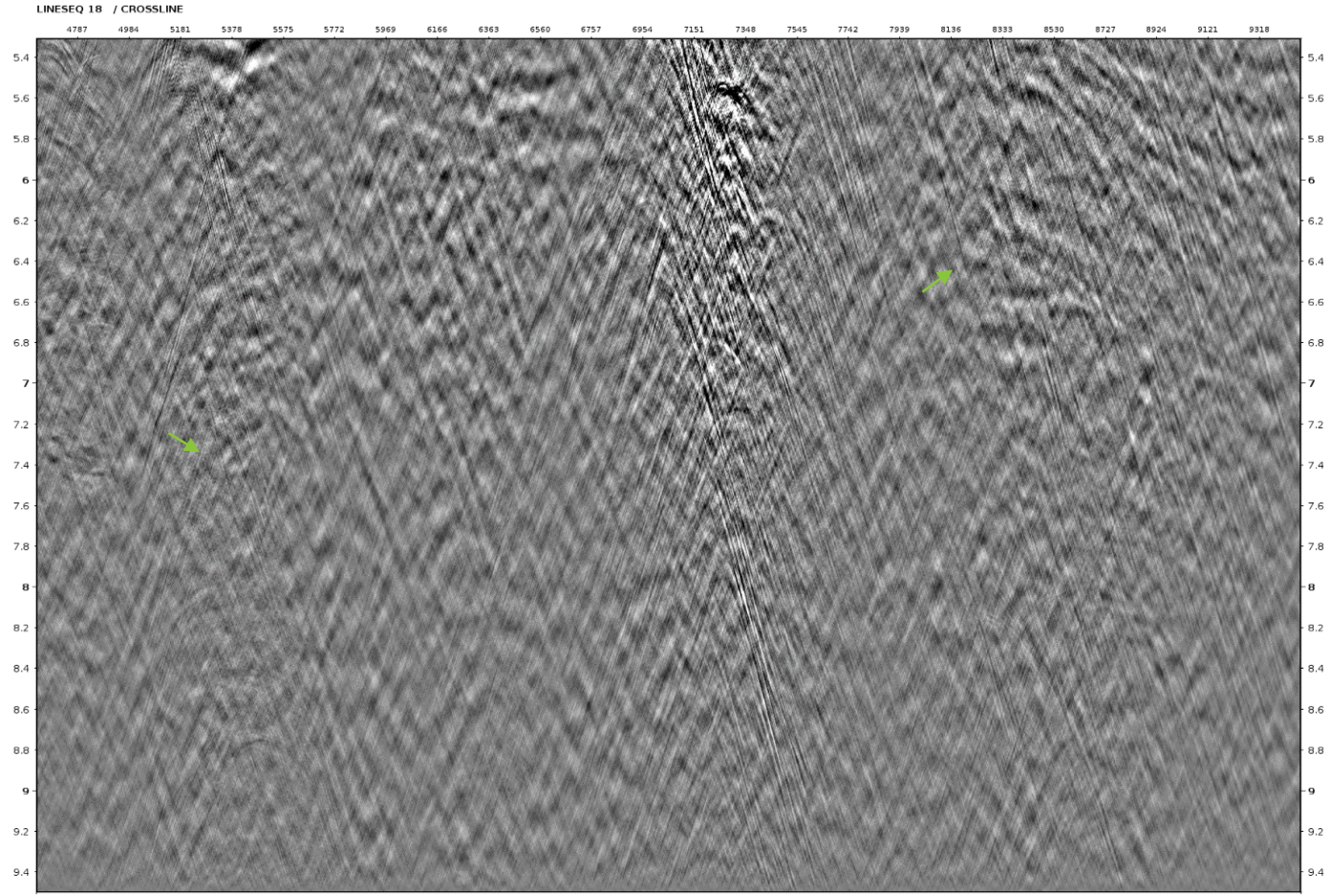


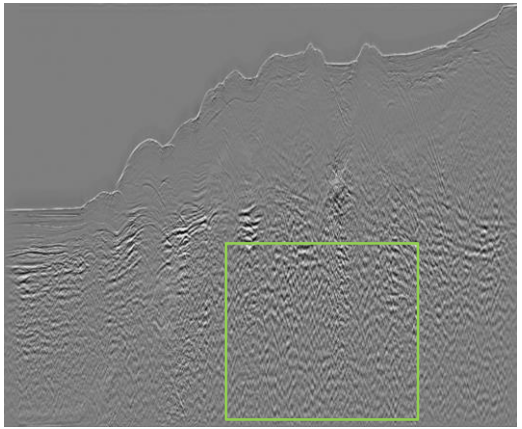


- Multiples are better attenuated with simultaneous subtraction.

© 2020 CGG

Zoom in Stack after SRME Subtraction

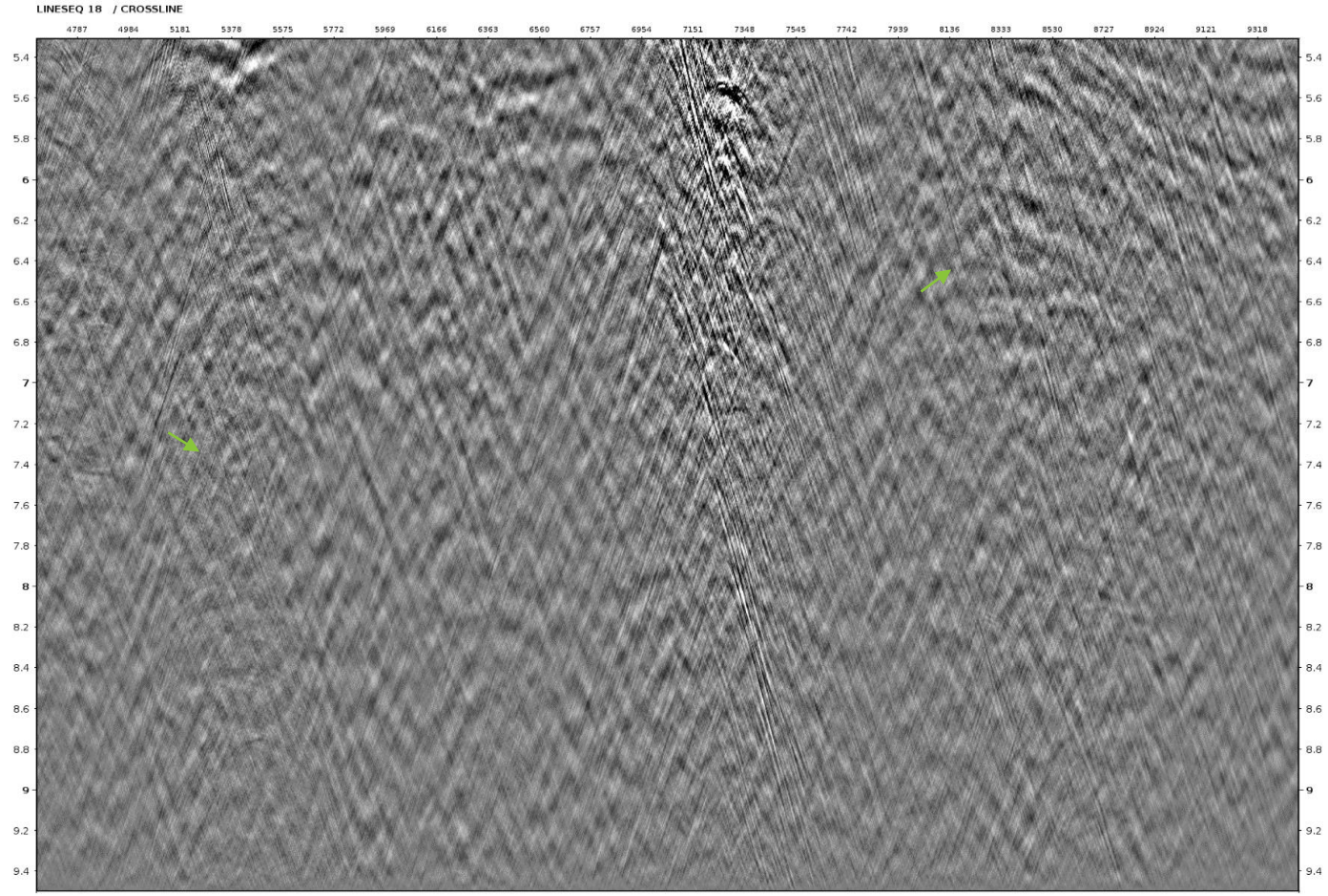


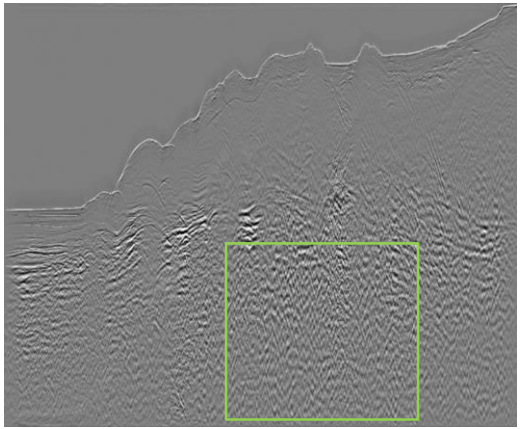


- Multiples are better attenuated with simultaneous subtraction.

© 2020 CGG

Zoom in Stack after SRME & MWD Subtraction

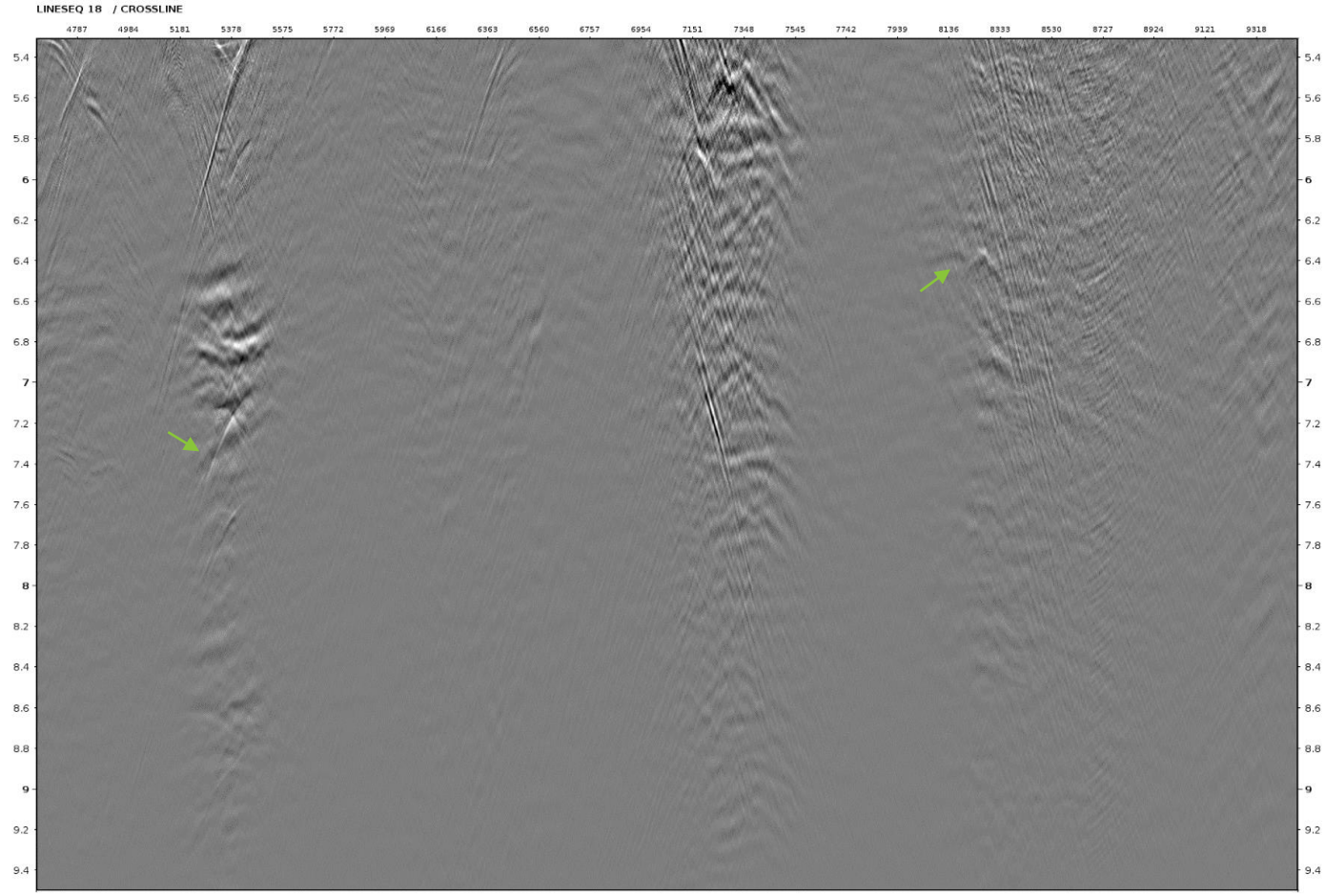




- Multiples are better attenuated with simultaneous subtraction.

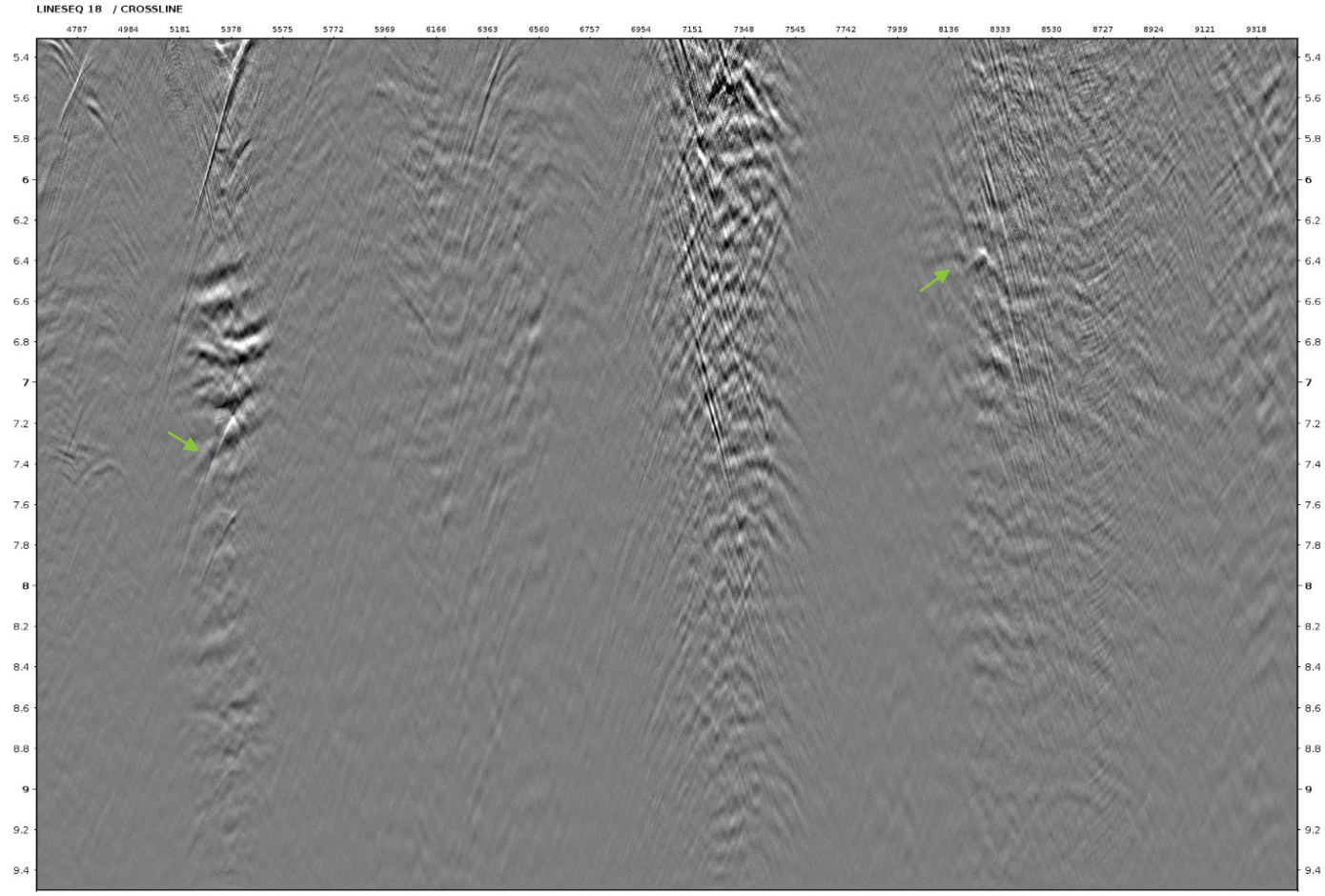
© 2020 CGG

Difference before – after SRME Subtraction



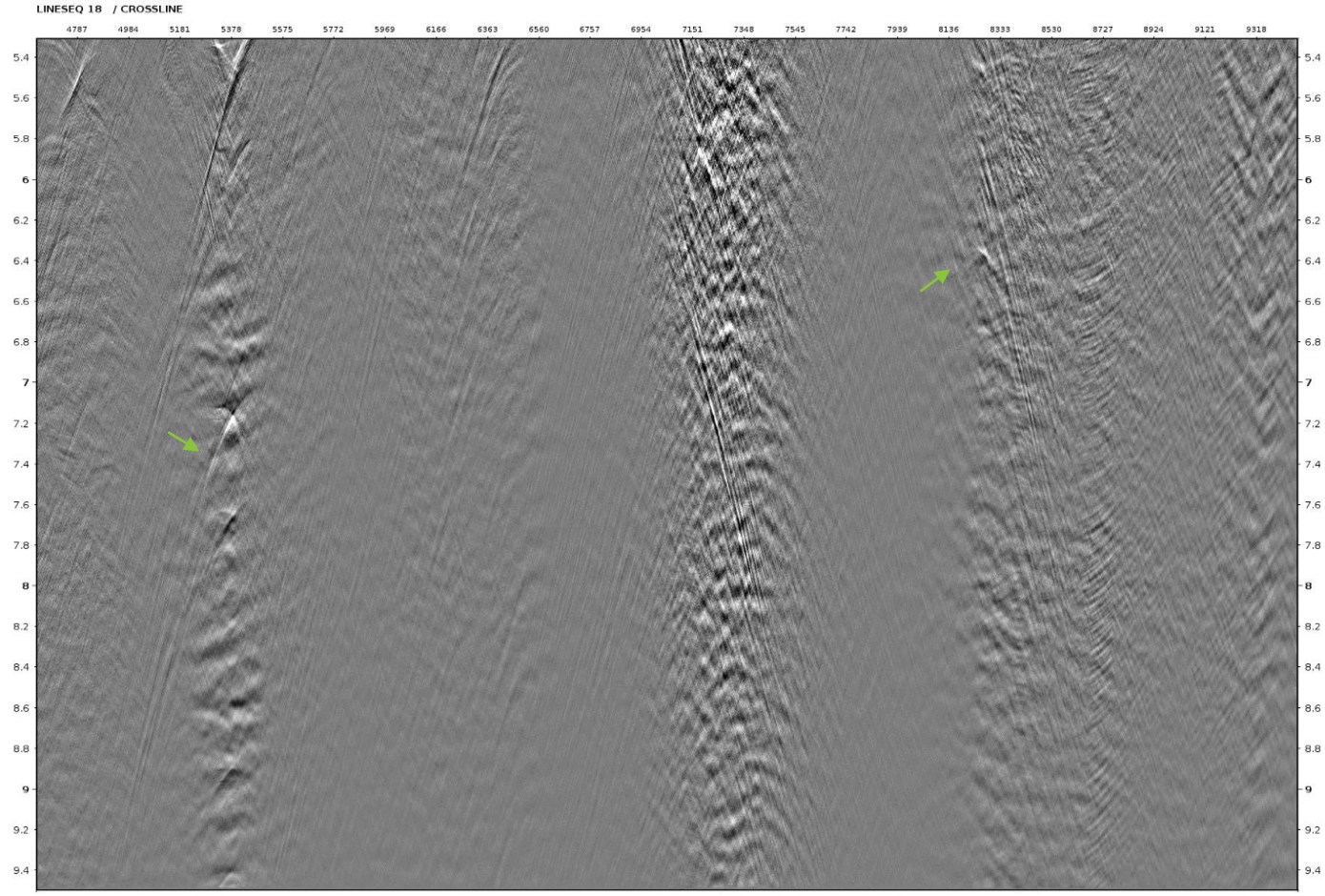
© 2020 CGG

Difference before – after SRME & MWD Subtraction



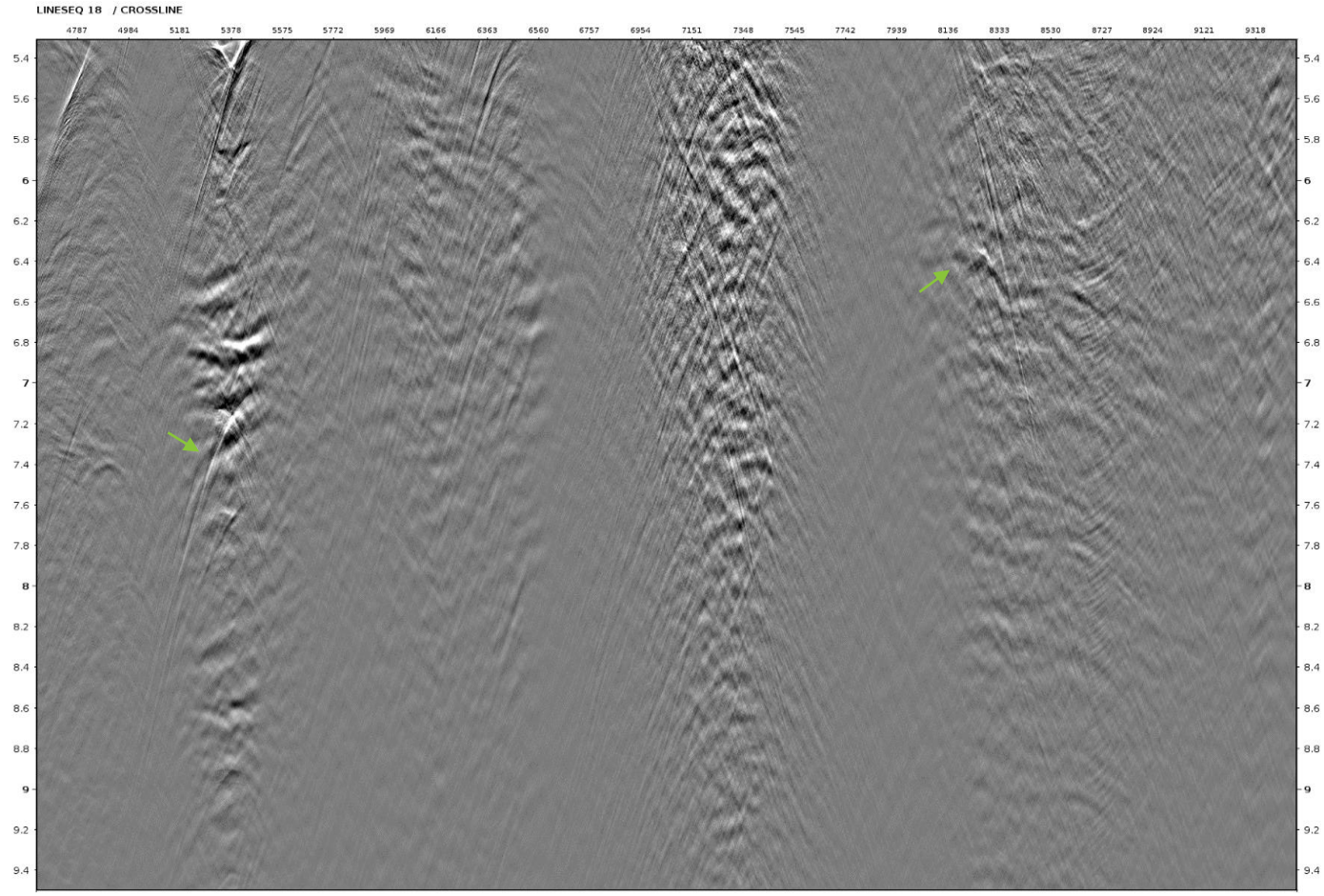
© 2020 CGG

Zoom in Stack – SRME Model



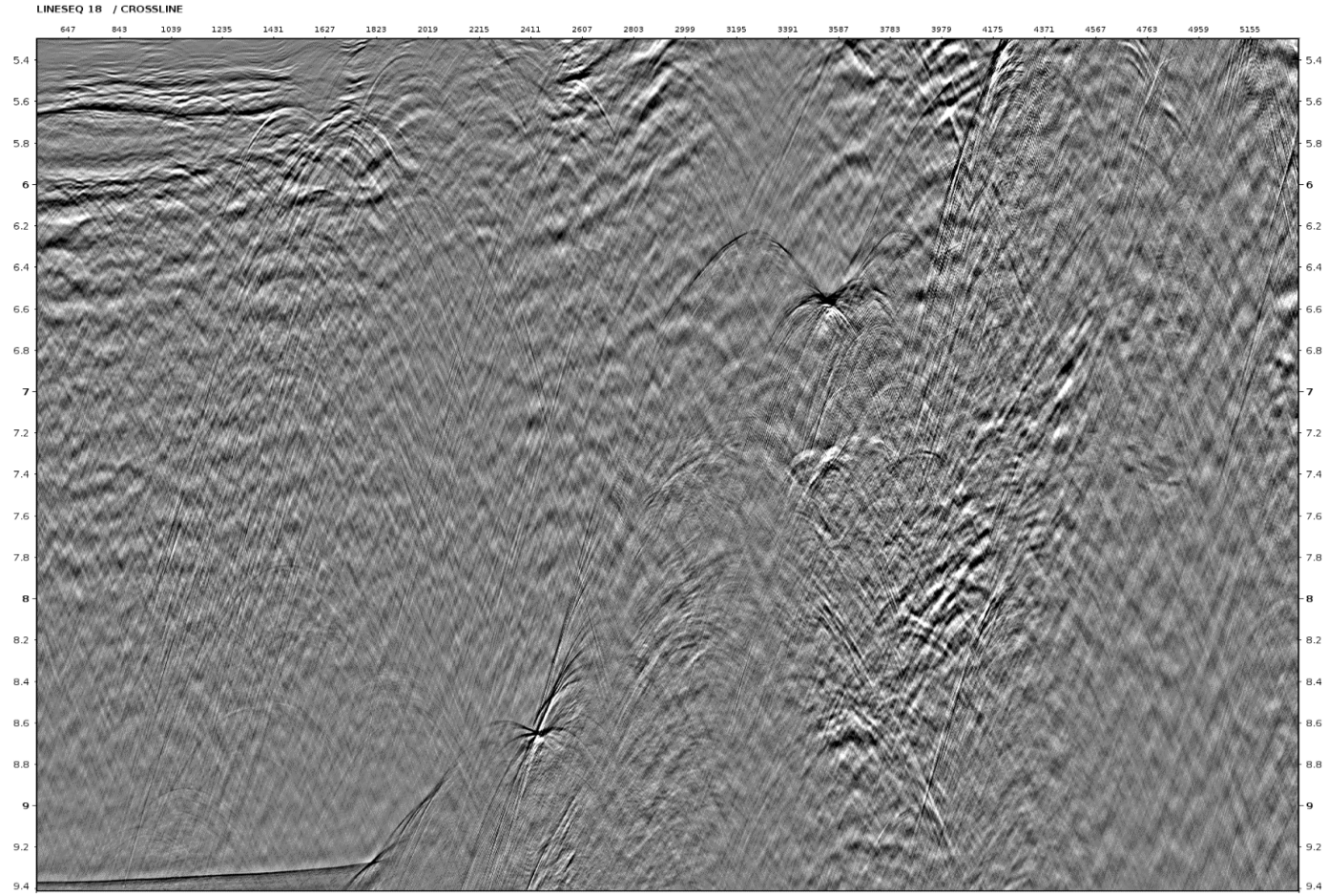
© 2020 CGG

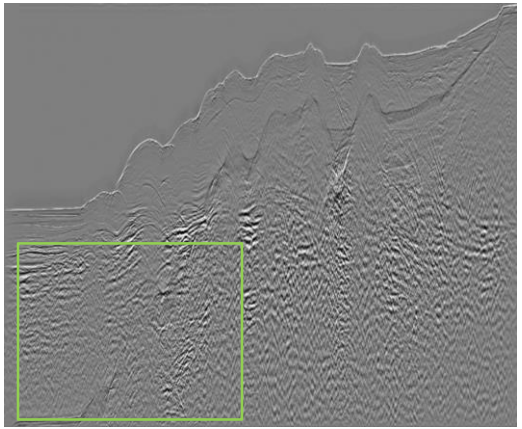
Zoom in Stack – MWD Model



© 2020 CGG

Zoom in Stack before Subtraction

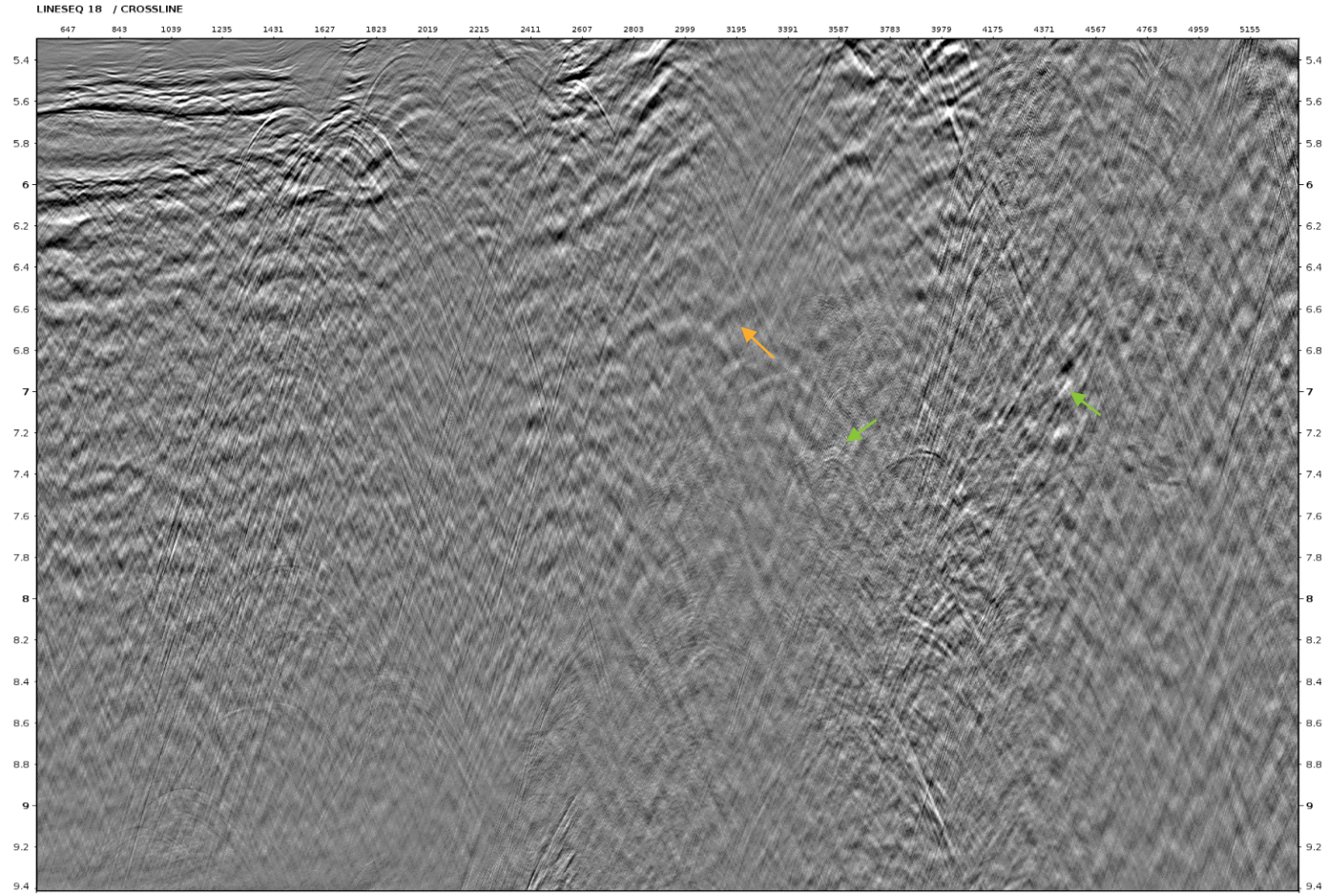


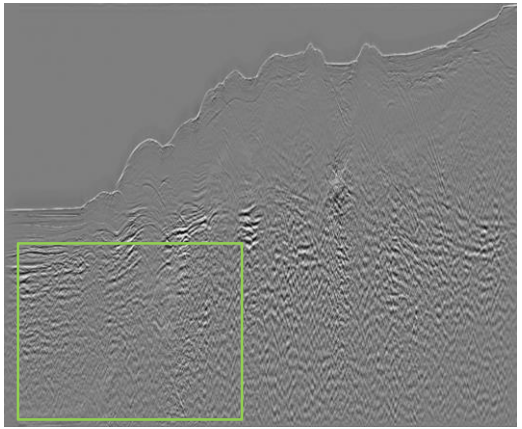


- Multiples are better attenuated with simultaneous subtraction.
- Primaries are protected by simultaneous subtraction flow.

© 2020 CGG

Zoom in Stack after SRME Subtraction

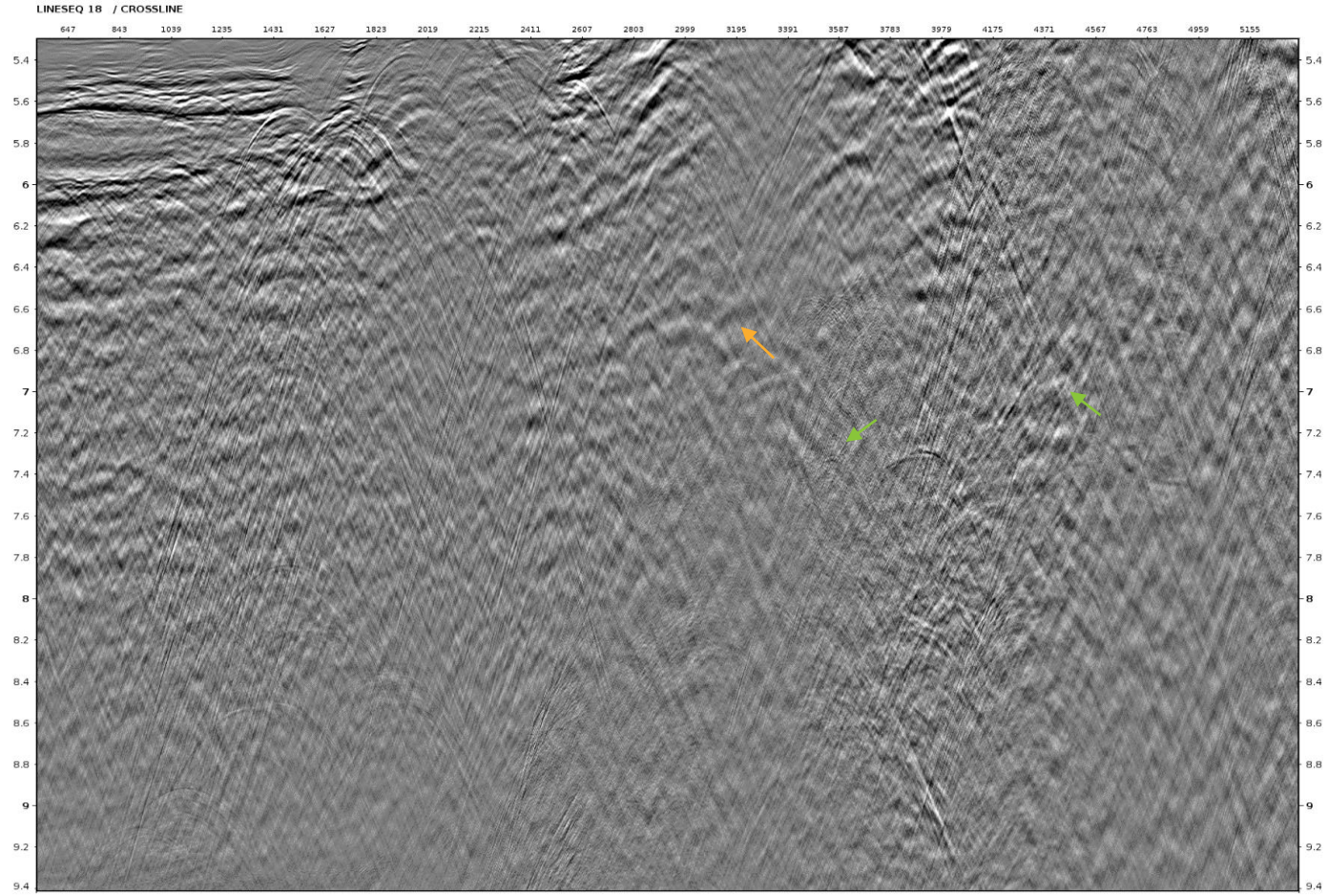


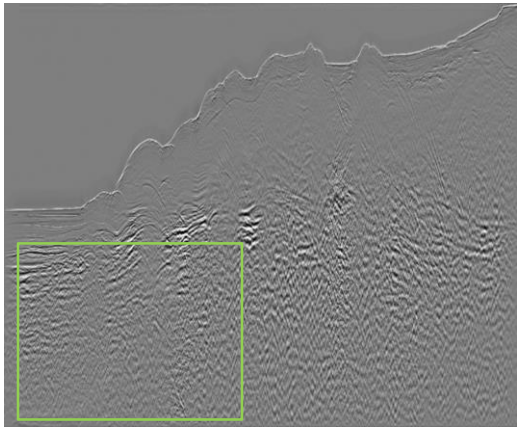


- Multiples are better attenuated with simultaneous subtraction.
- Primaries are protected by simultaneous subtraction flow.

© 2020 CGG

Zoom in Stack after SRME & MWD Subtraction

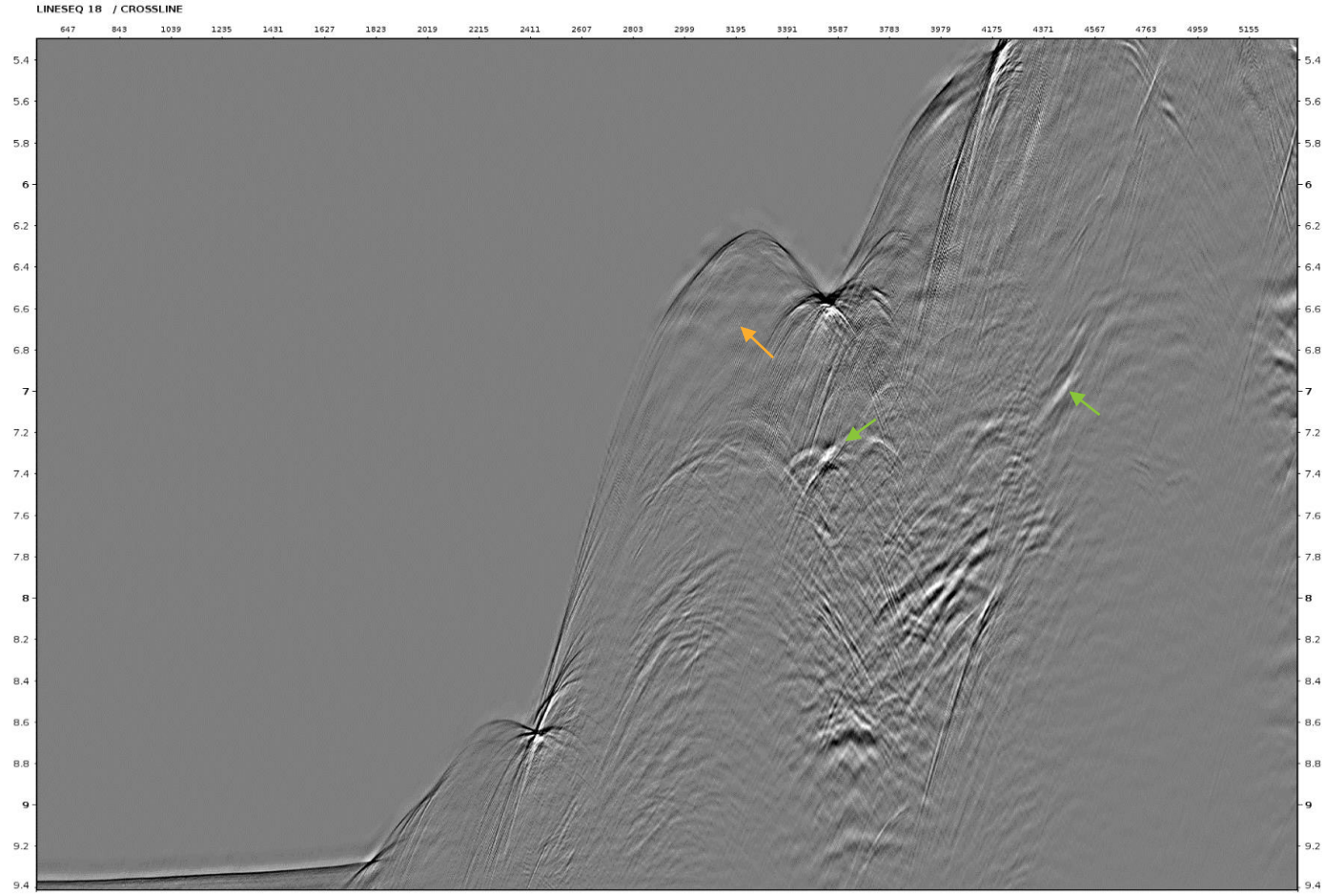




- Multiples are better attenuated with simultaneous subtraction.
- Primaries are protected by simultaneous subtraction flow.

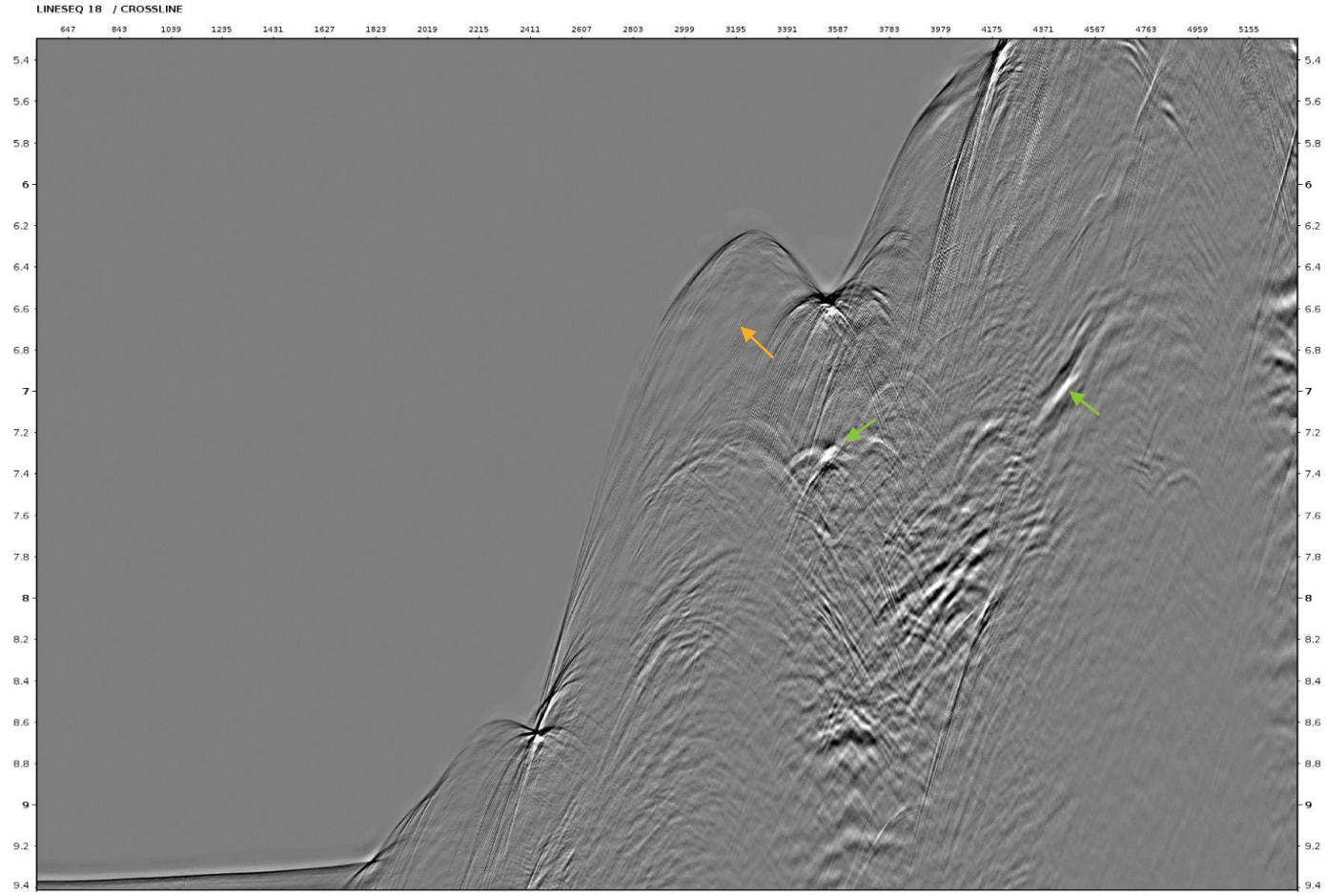
© 2020 CGG

Difference before – after SRME Subtraction



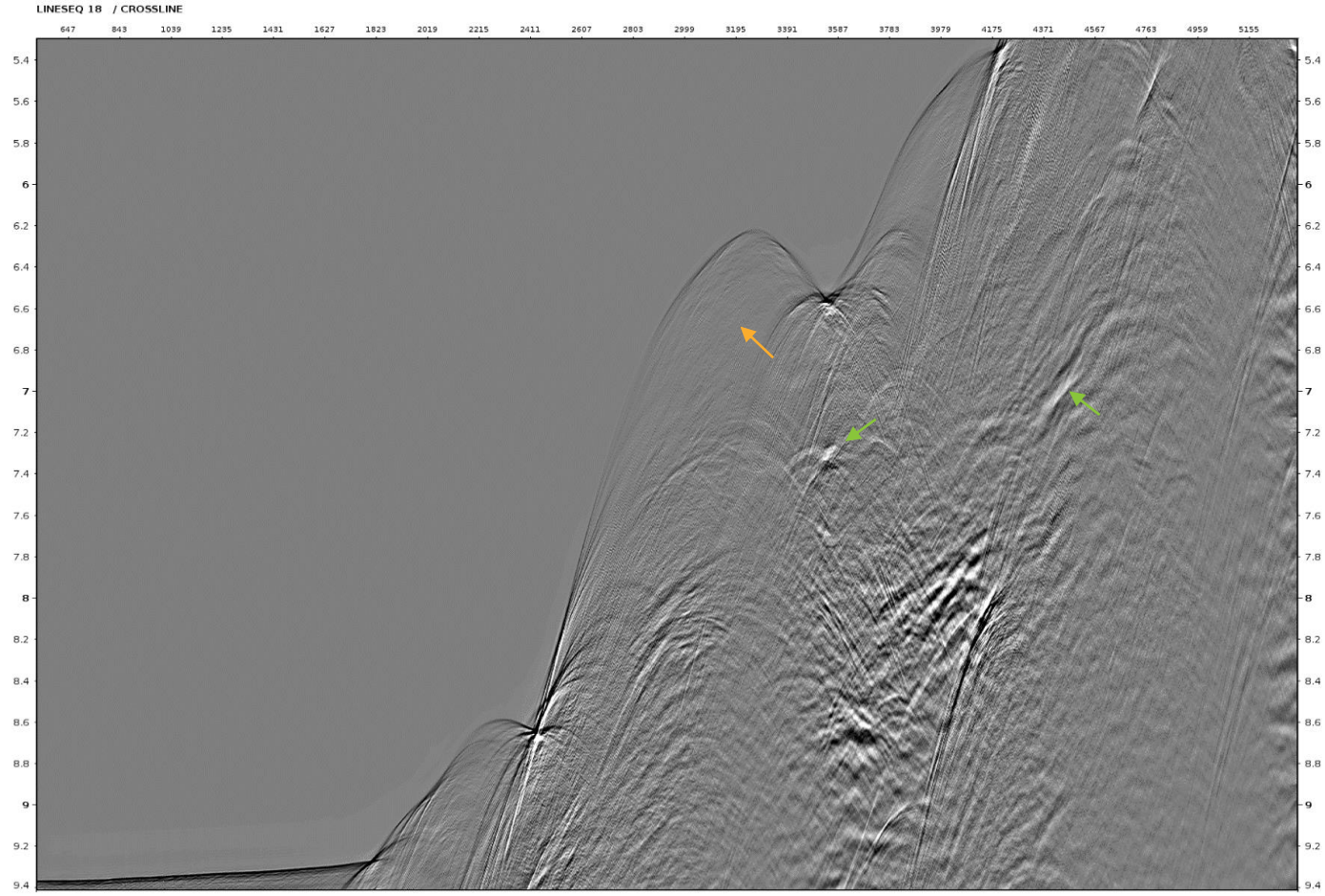
© 2020 CGG

Difference before – after SRME & MWD Subtraction



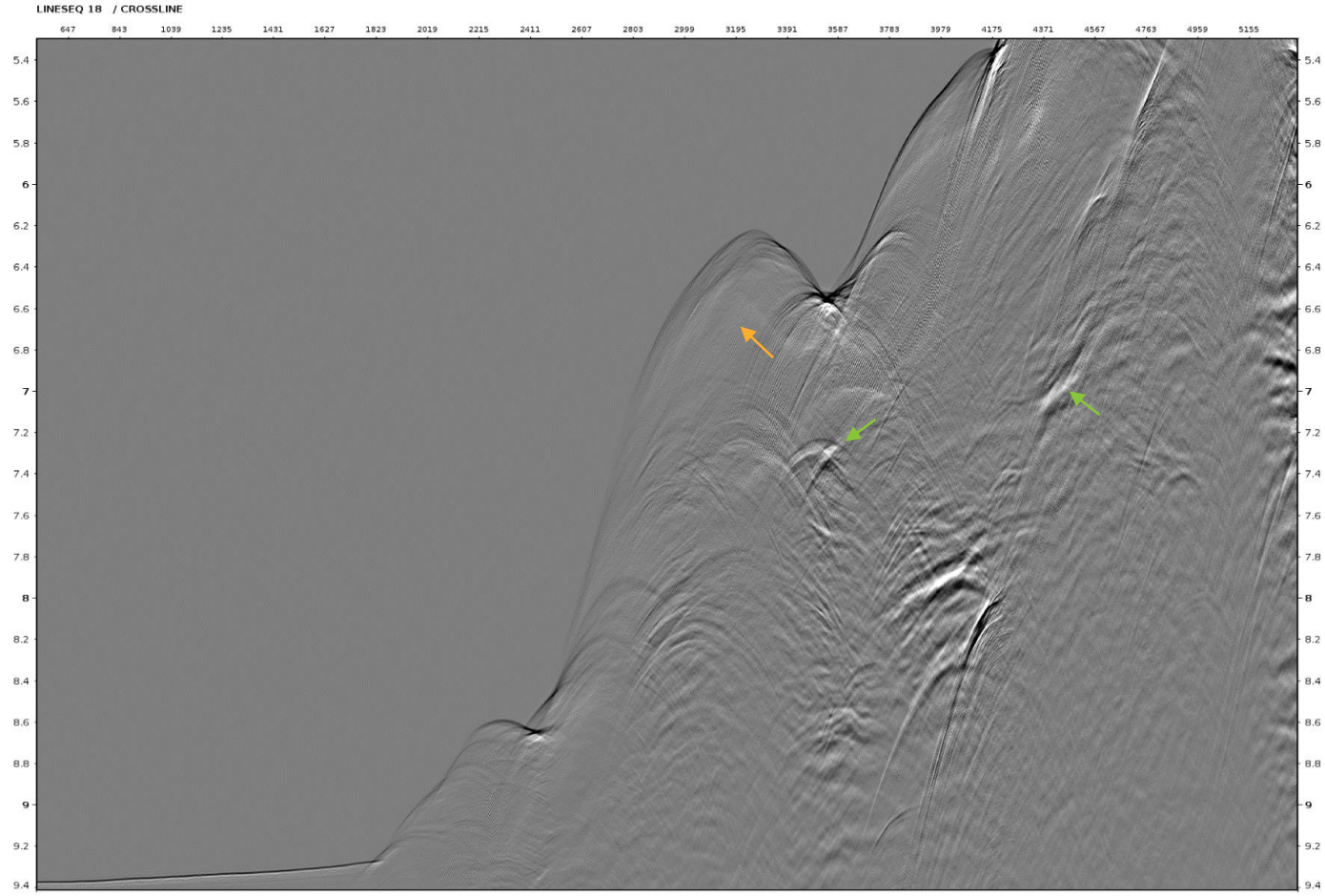
© 2020 CGG

Zoom in Stack – SRME Model



© 2020 CGG

Zoom in Stack – MWD Model



© 2020 CGG

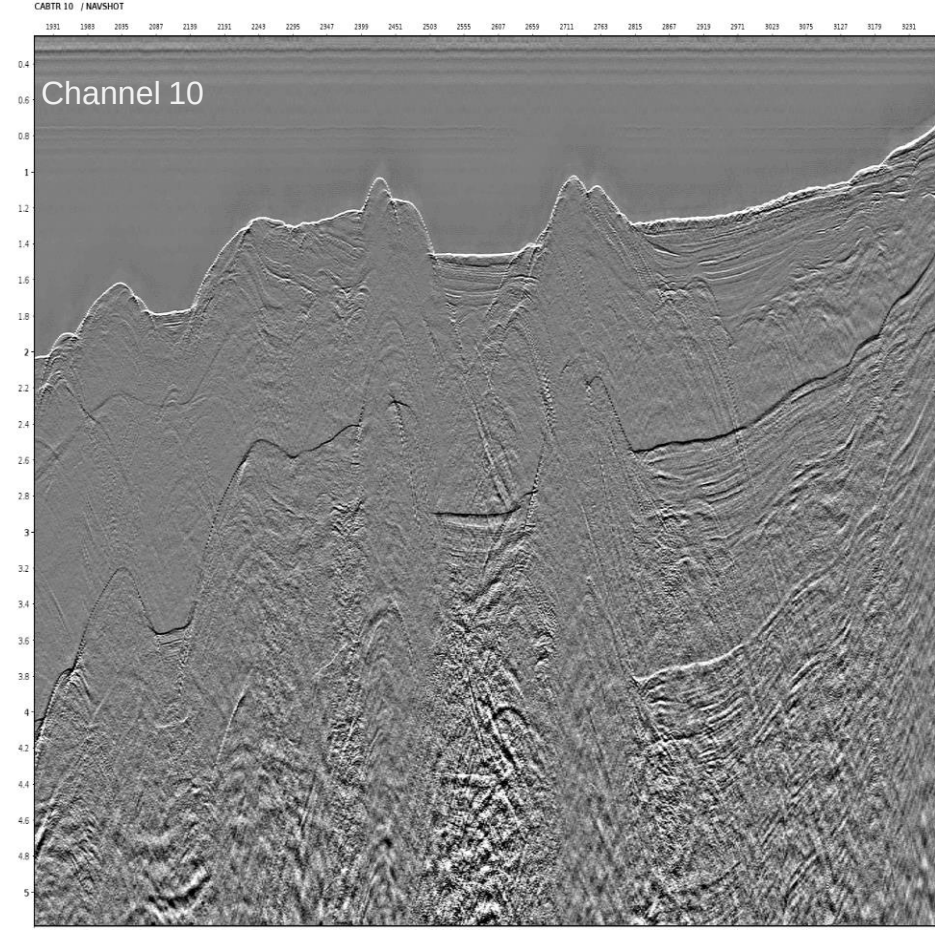
Seq 018

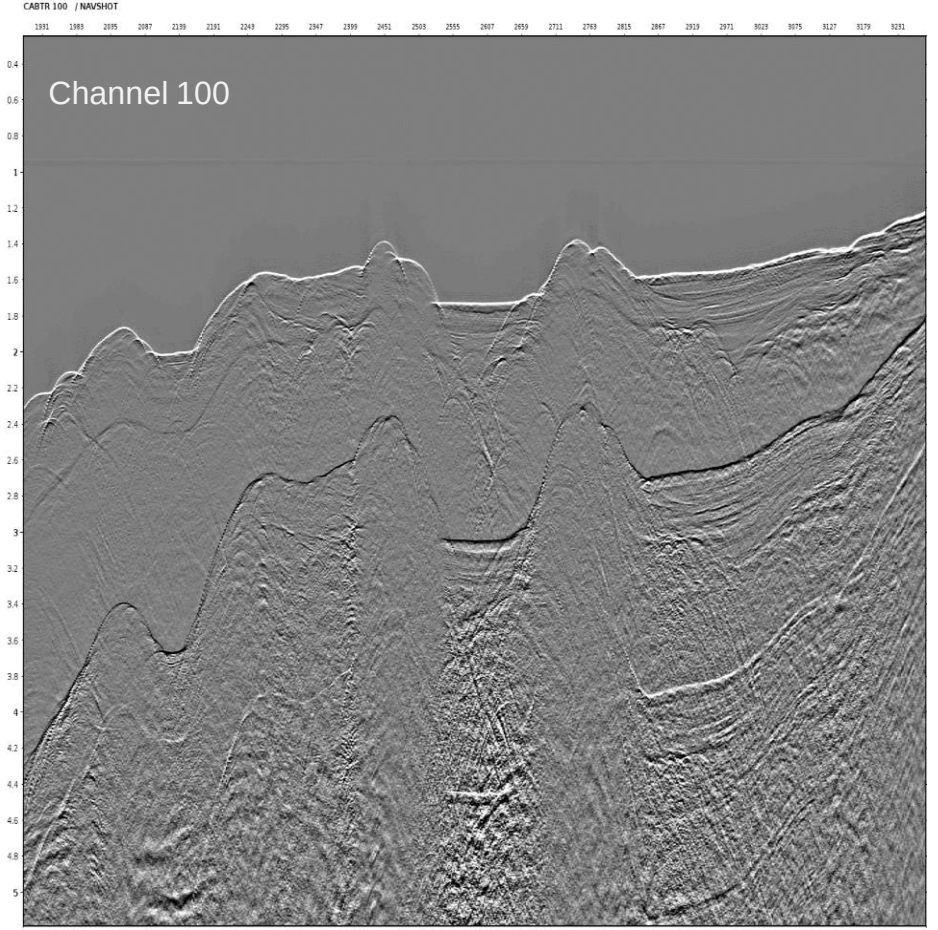
Stack

Common Channel

Shot Gathers

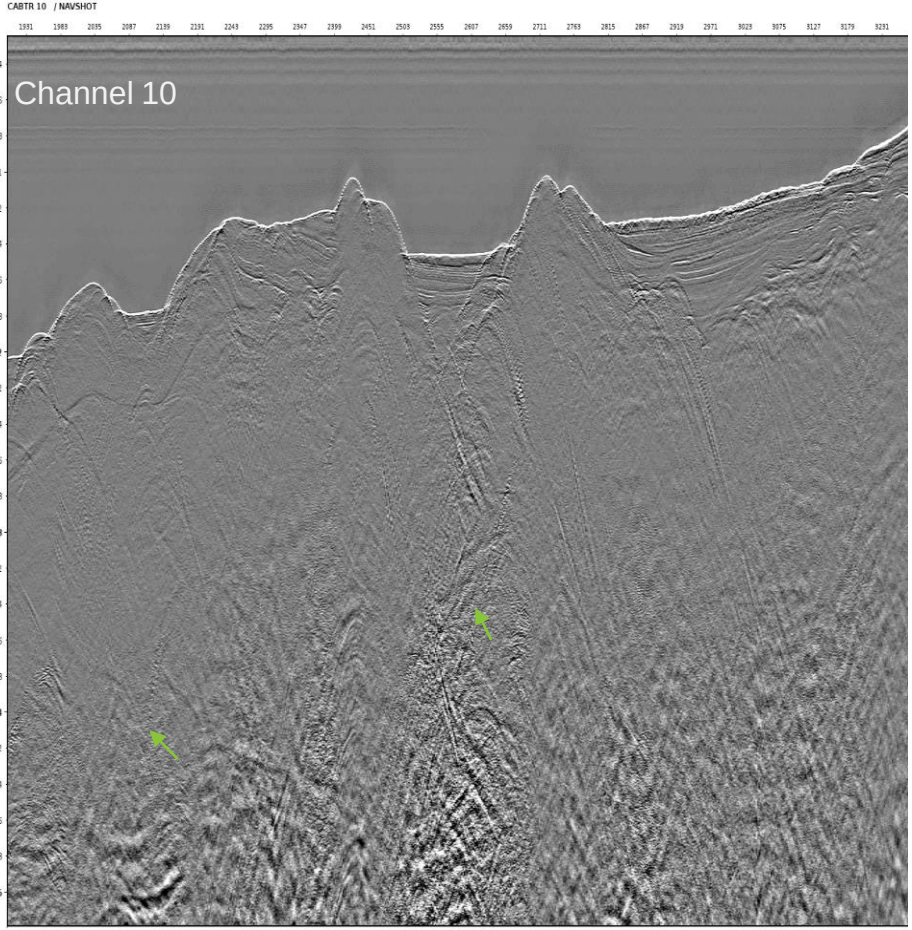
Common Channel before Subtraction

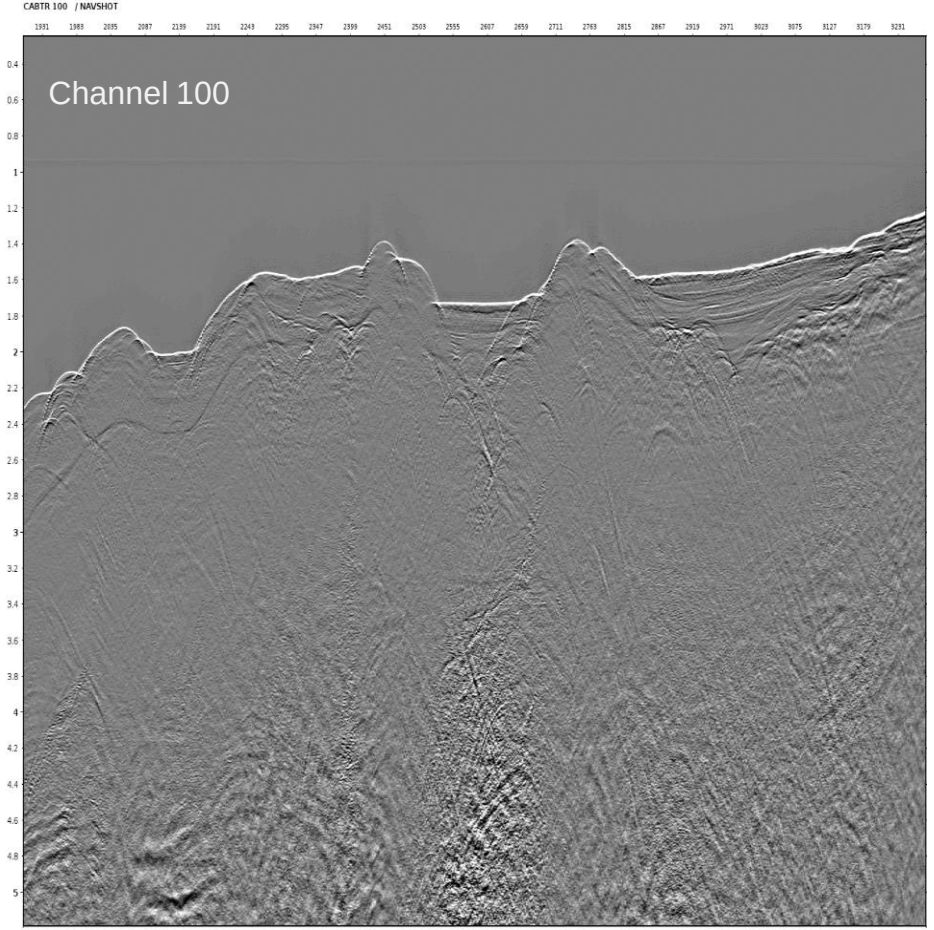




© 2020 CGG

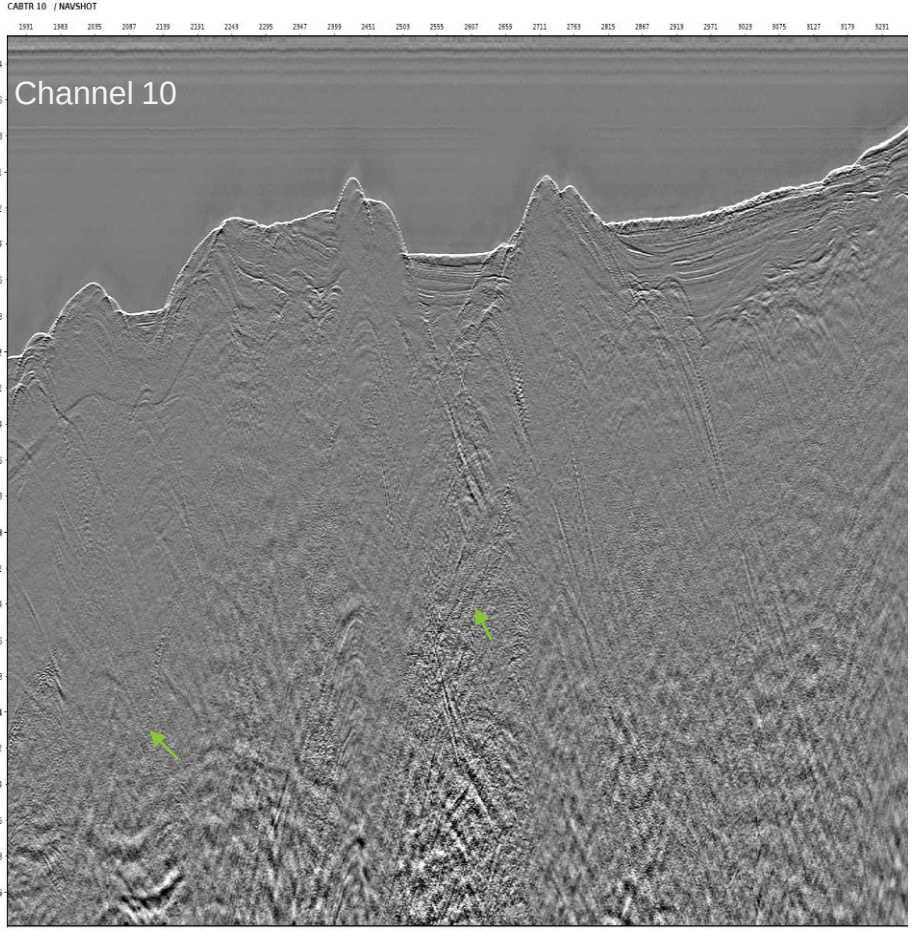
Common Channel after SRME Subtraction

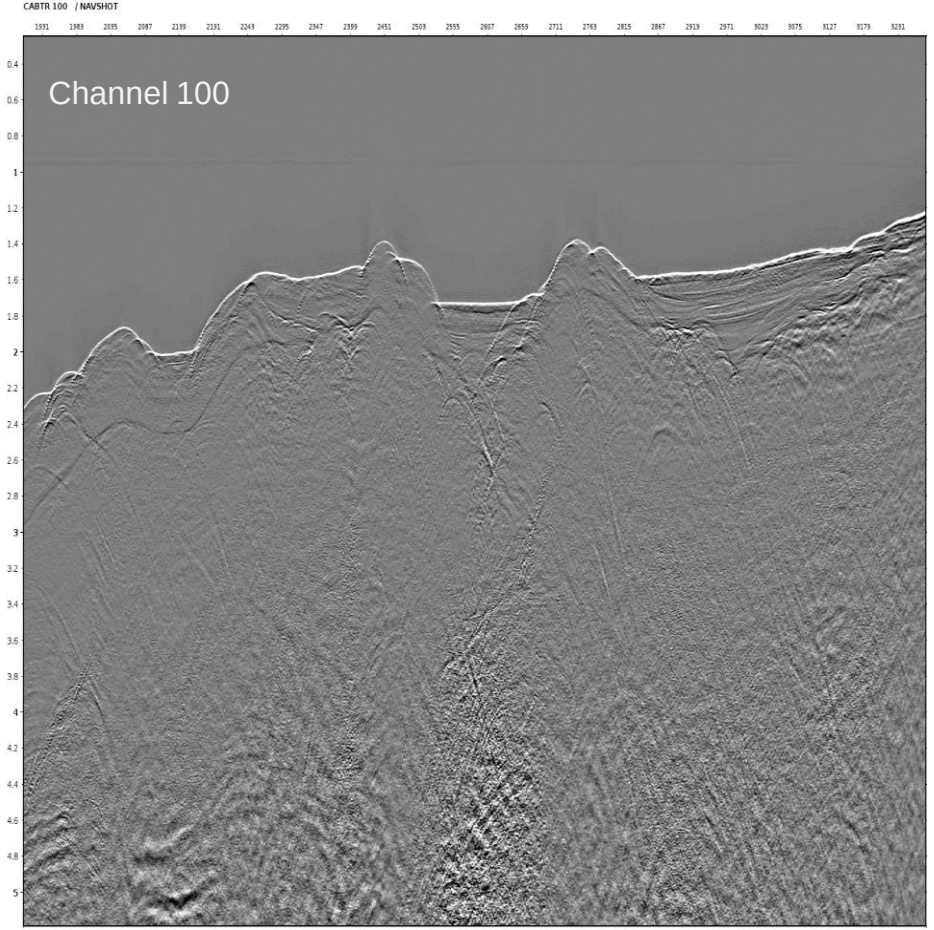




© 2020 CGG

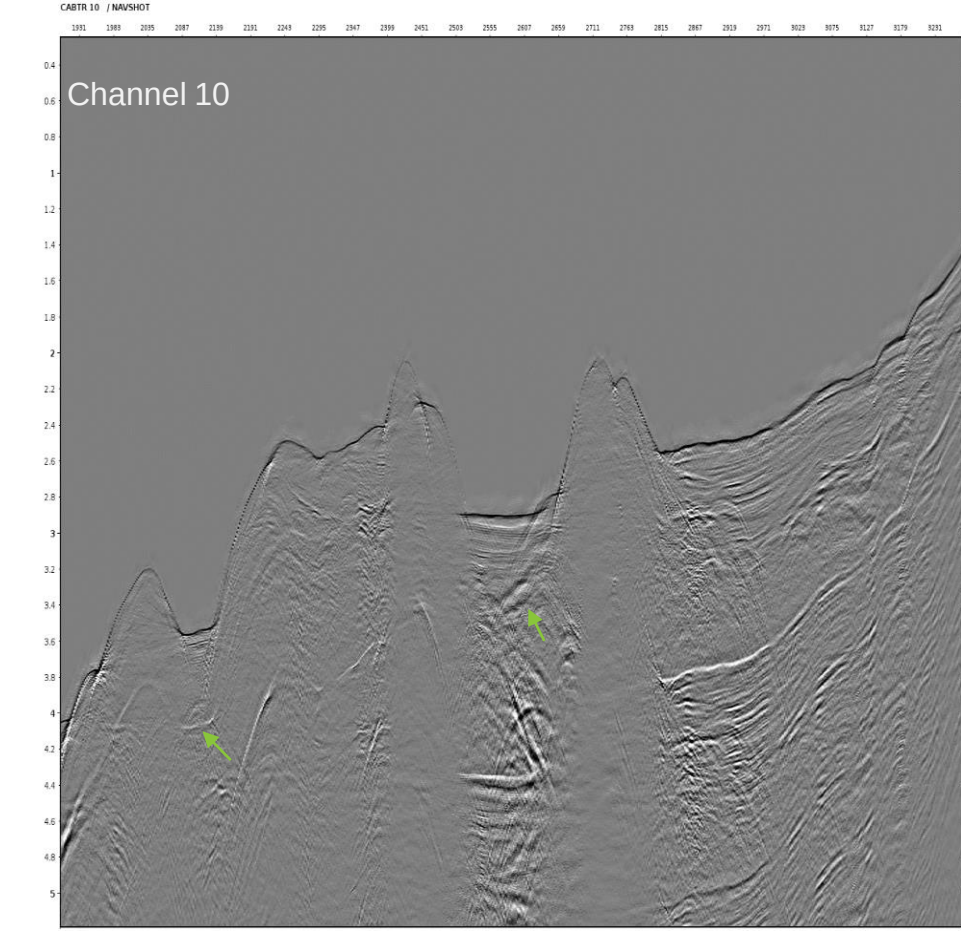
Common Channel after SRME & MWD Subtraction

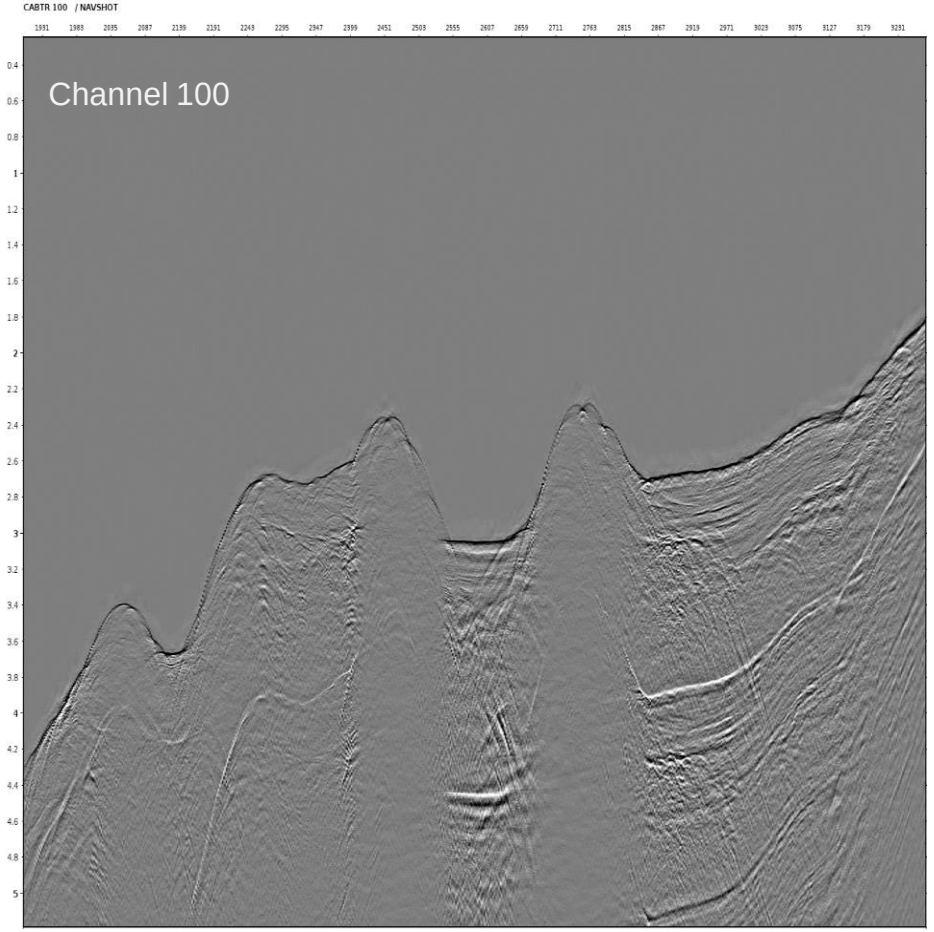




© 2020 CGG

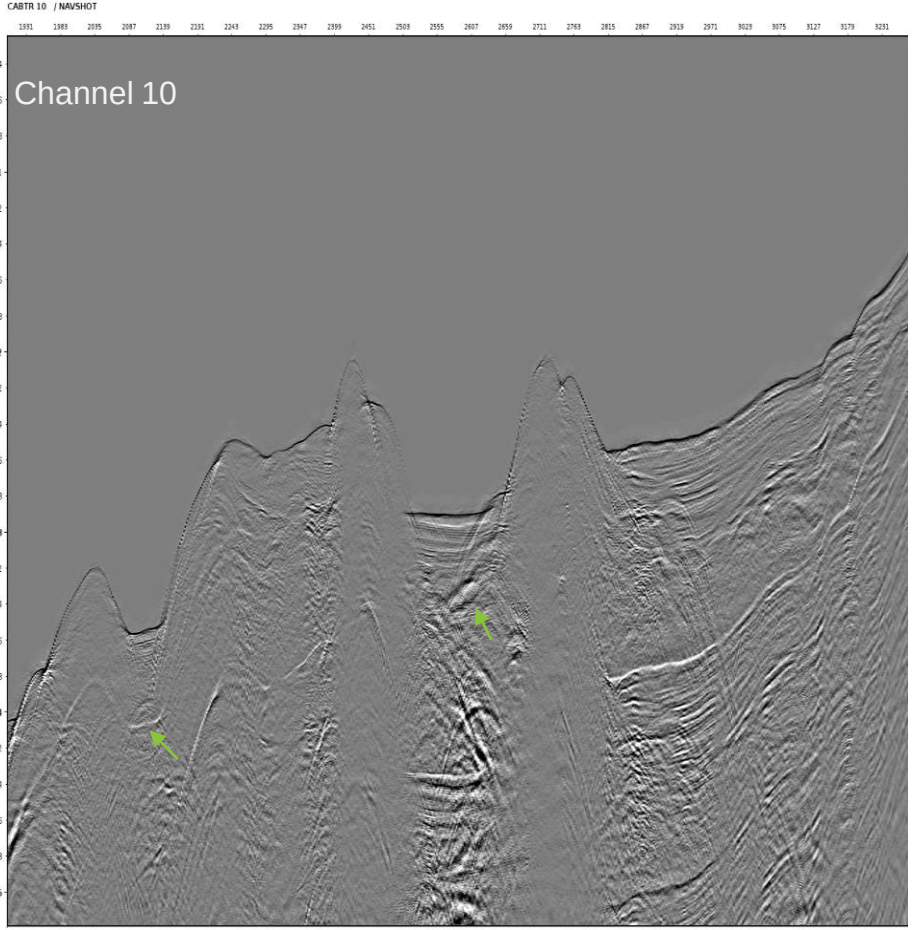
Difference before – after SRME Subtraction

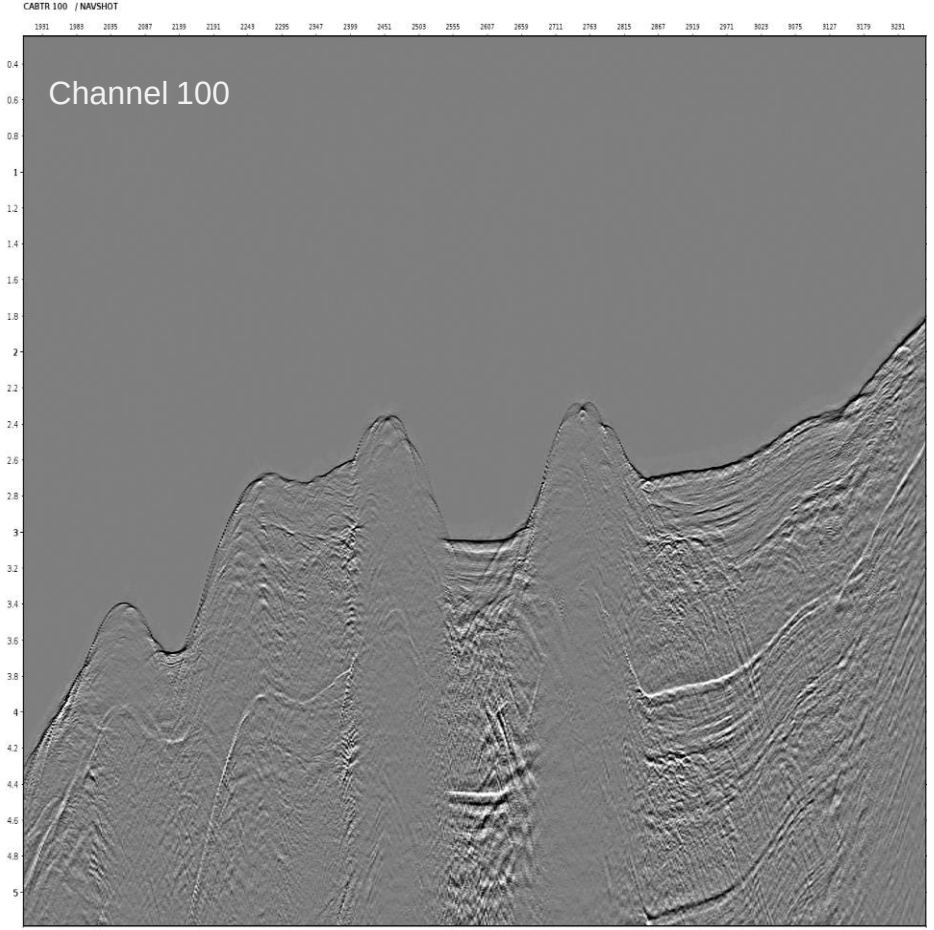




© 2020 CGG

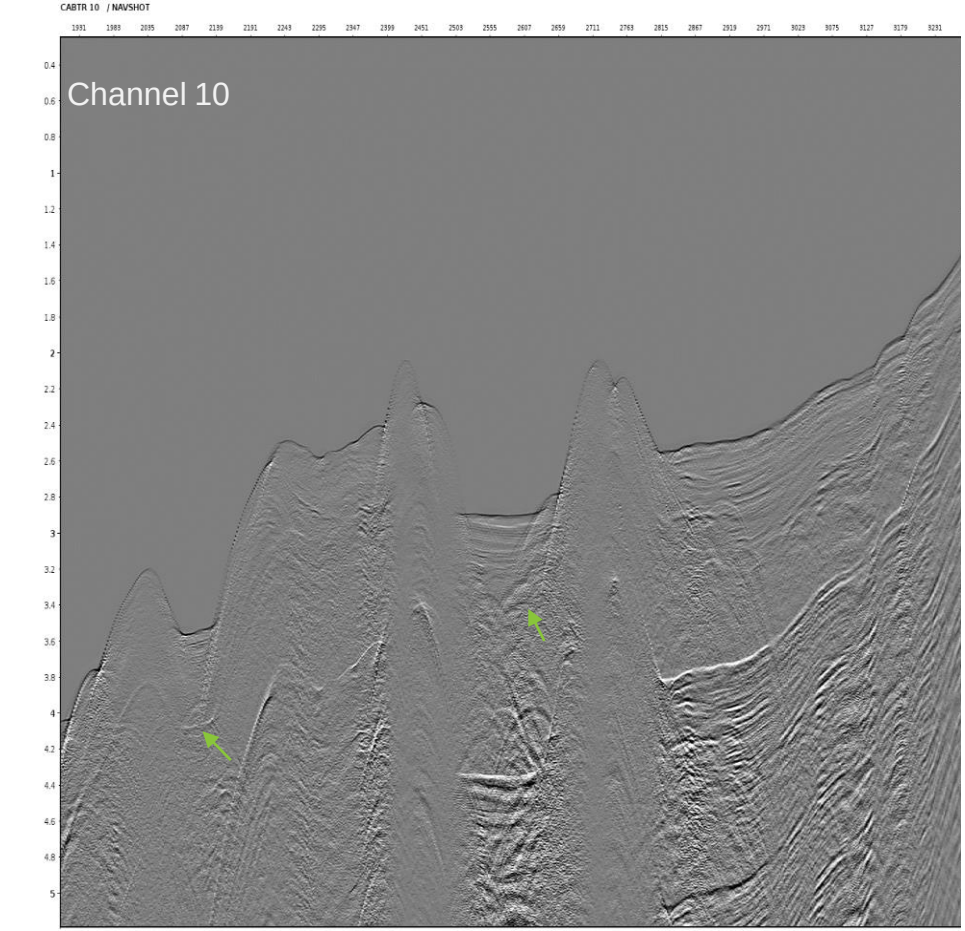
Difference before – after SRME & MWD Subtraction

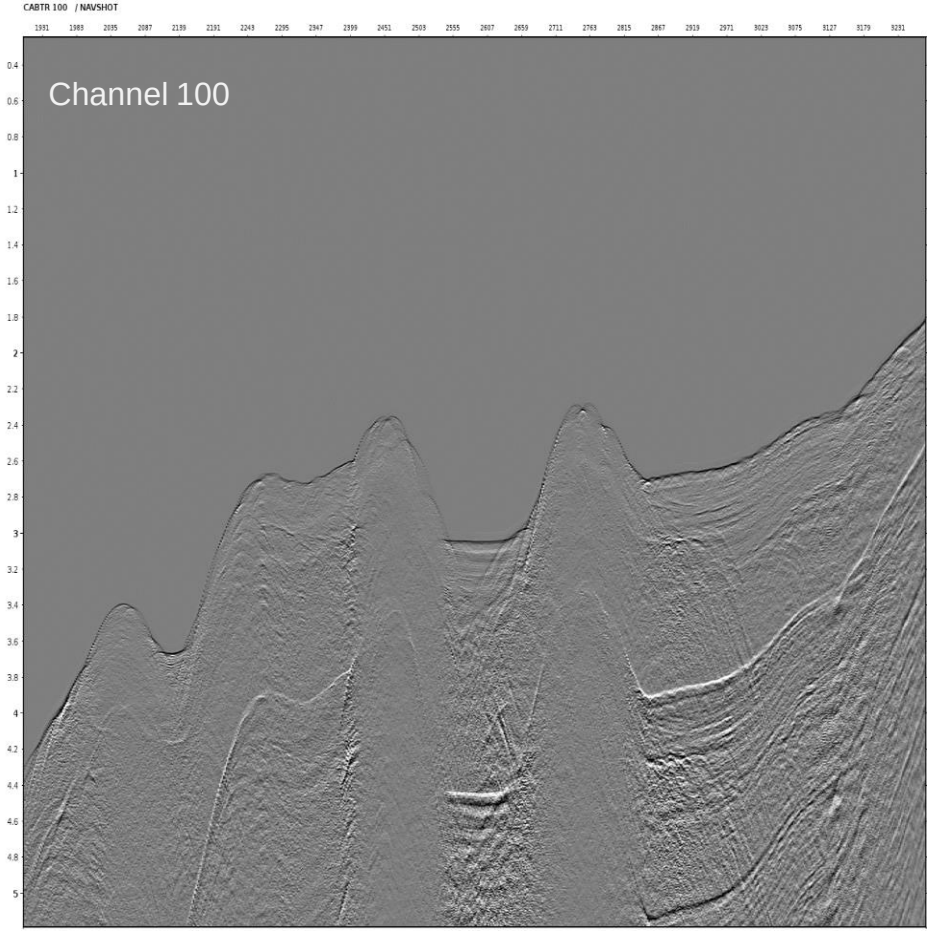




© 2020 CGG

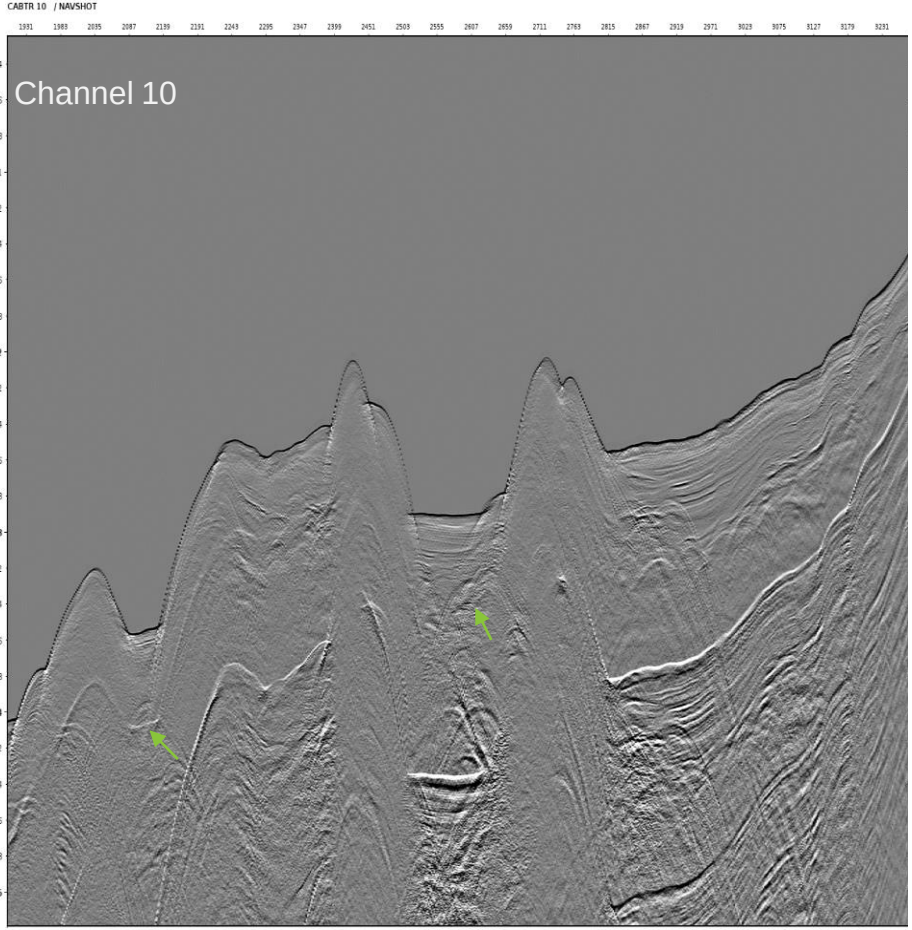
Common Channel SRME Model

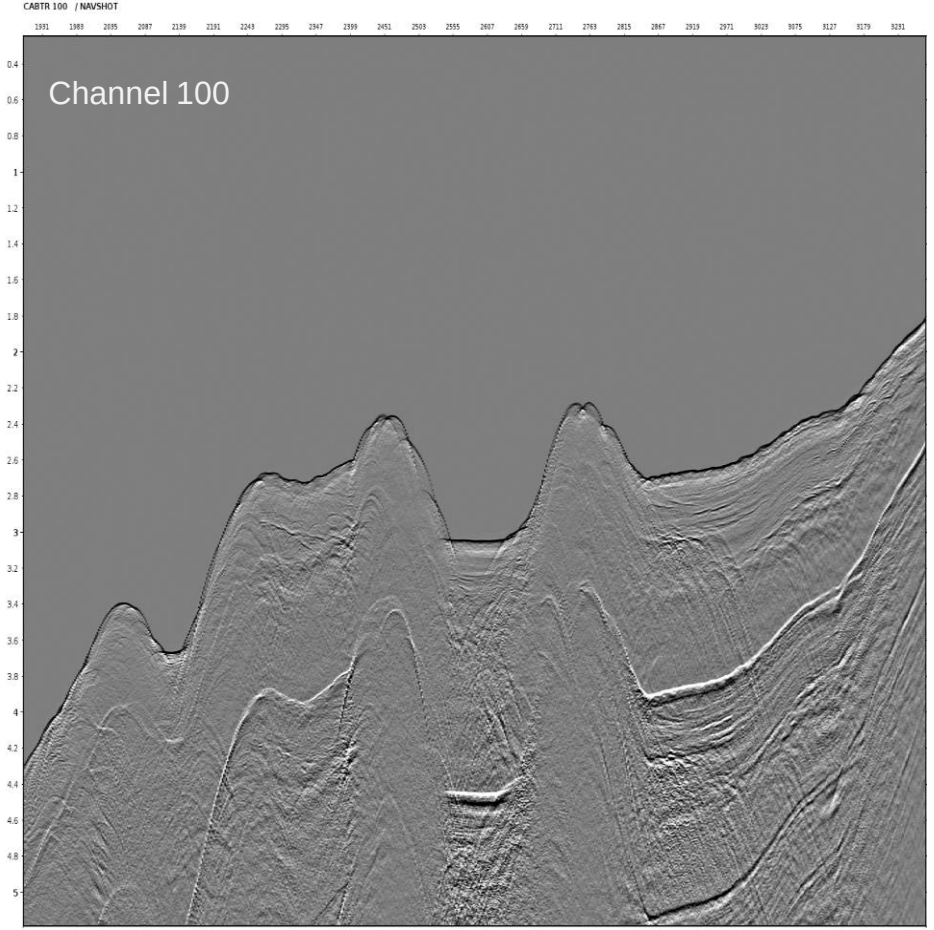




© 2020 CGG

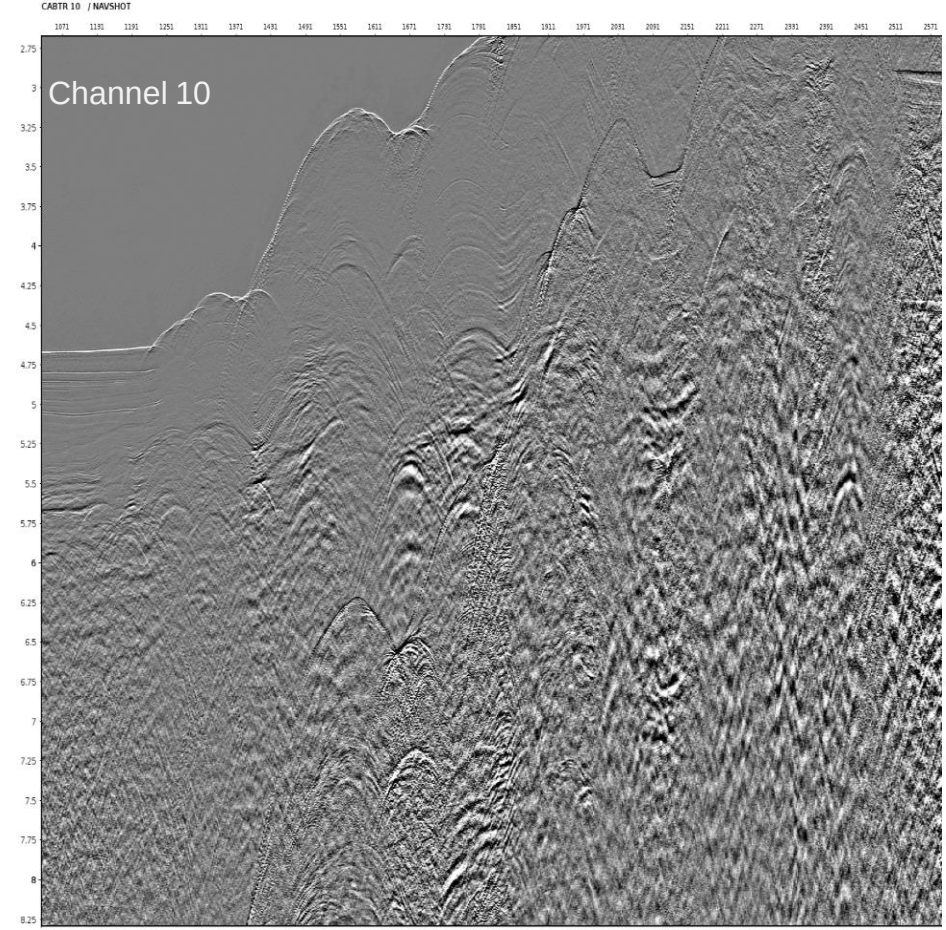
Common Channel MWD Model

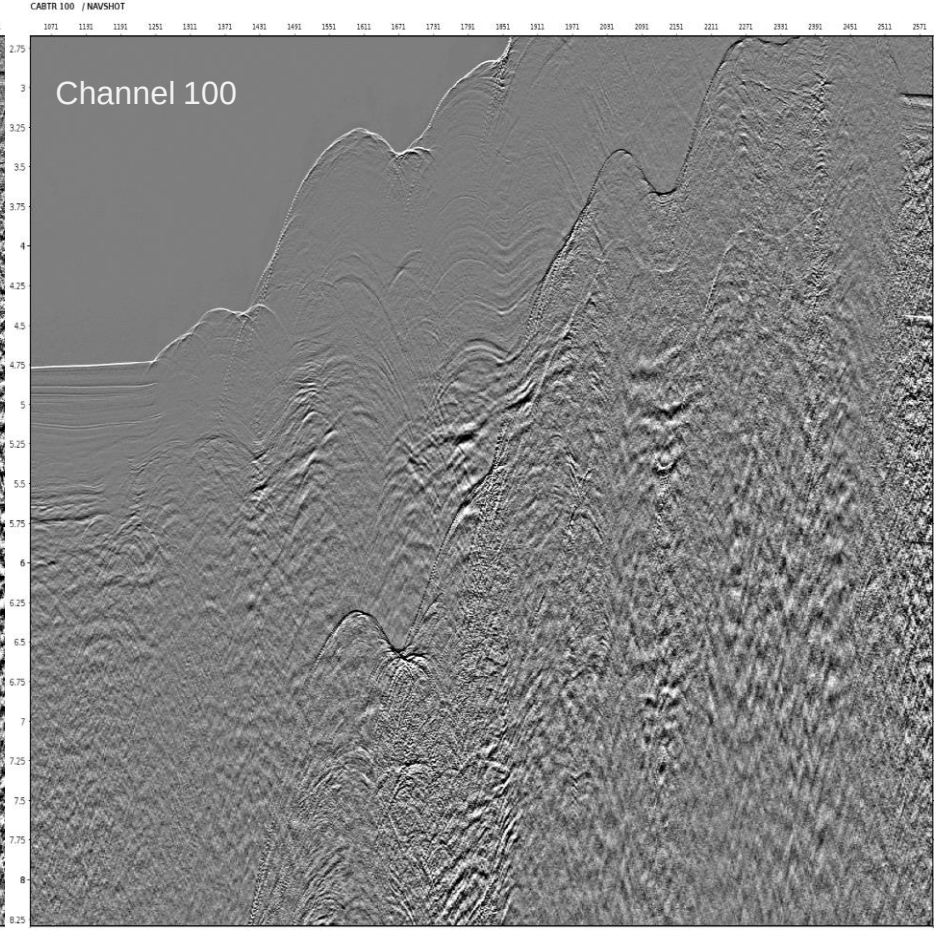




© 2020 CGG

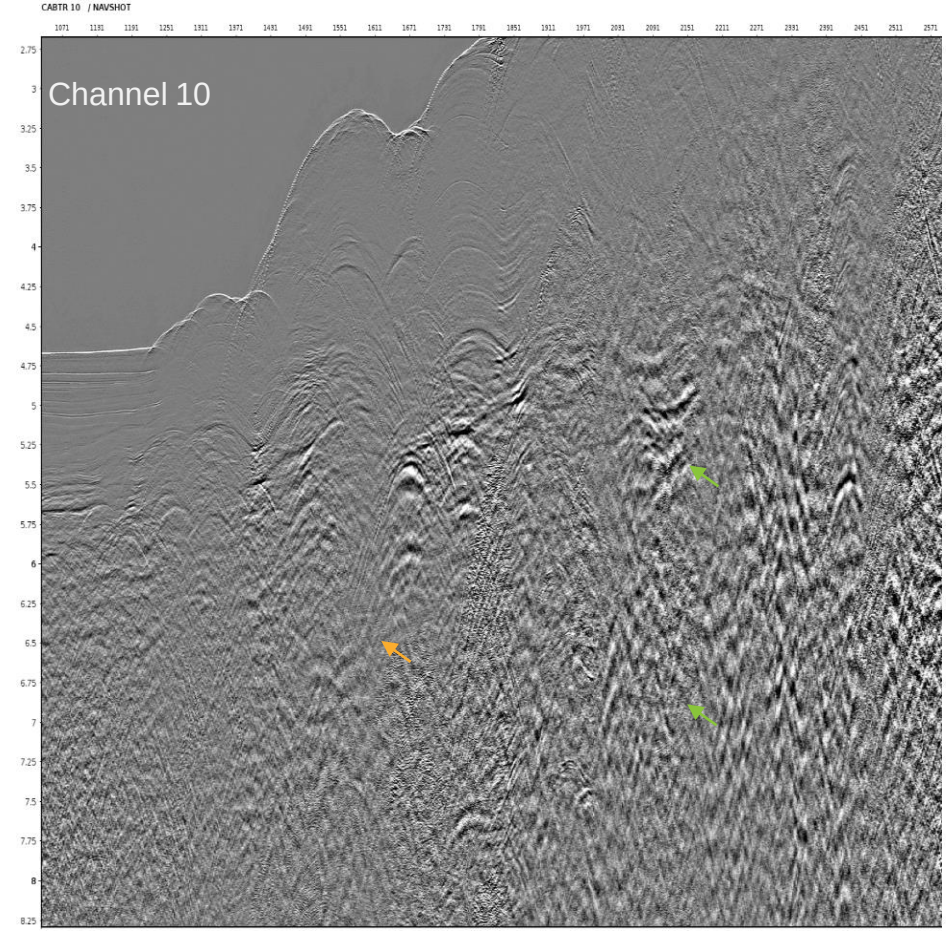
Common Channel before Subtraction

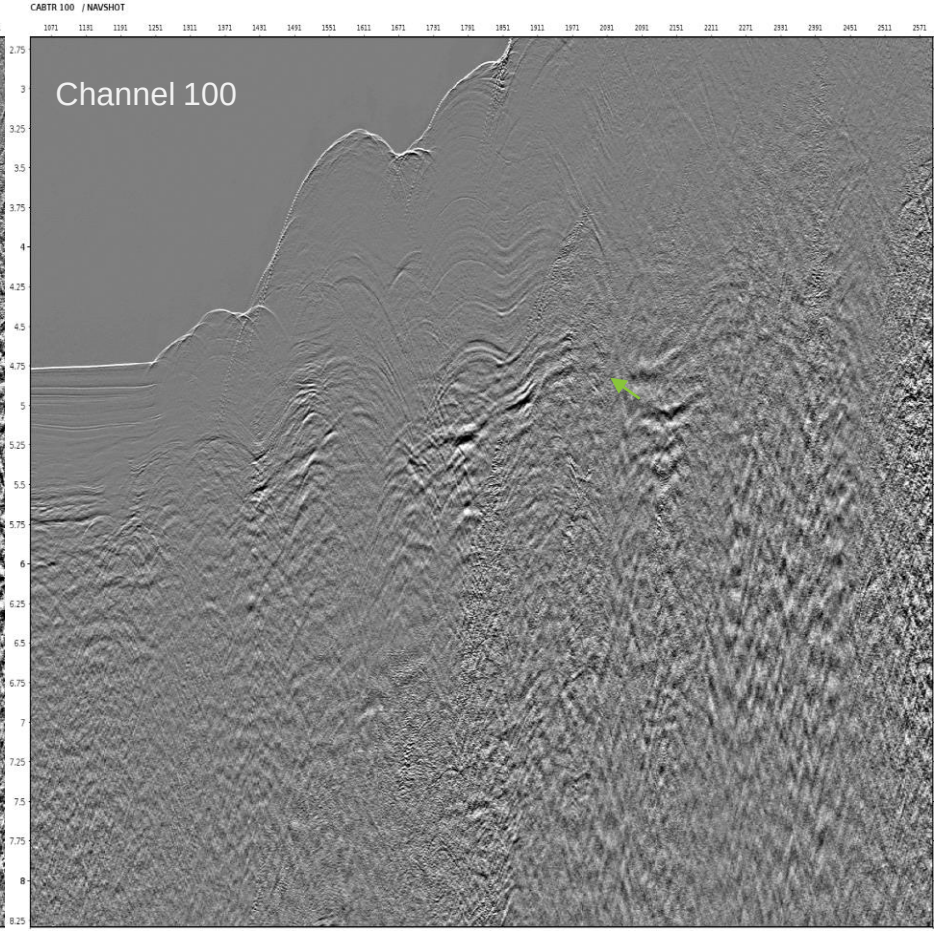




© 2020 CGG

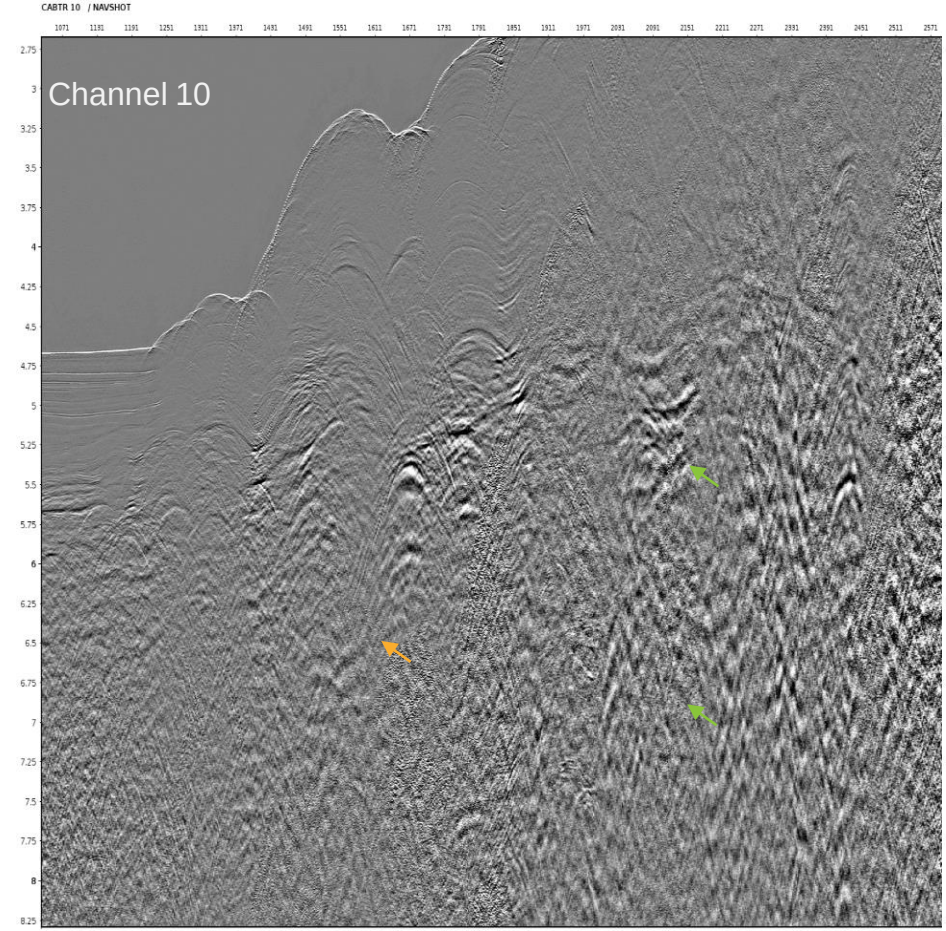
Common Channel after SRME Subtraction

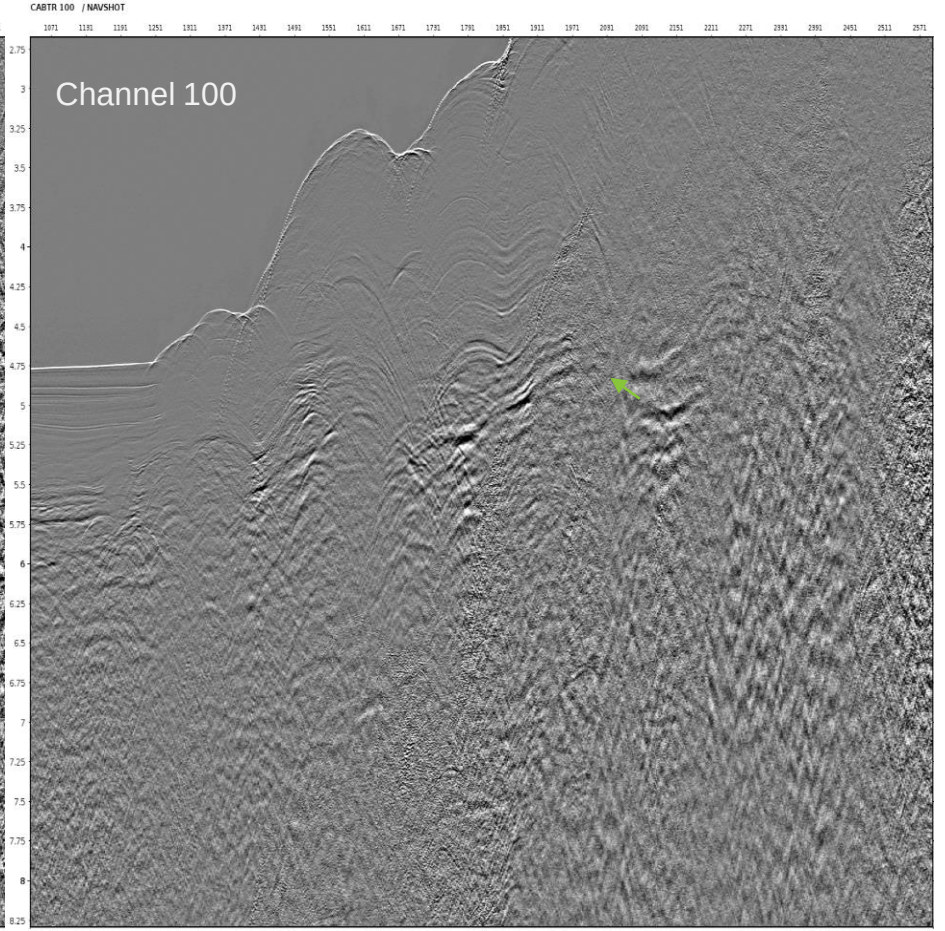




© 2020 CGG

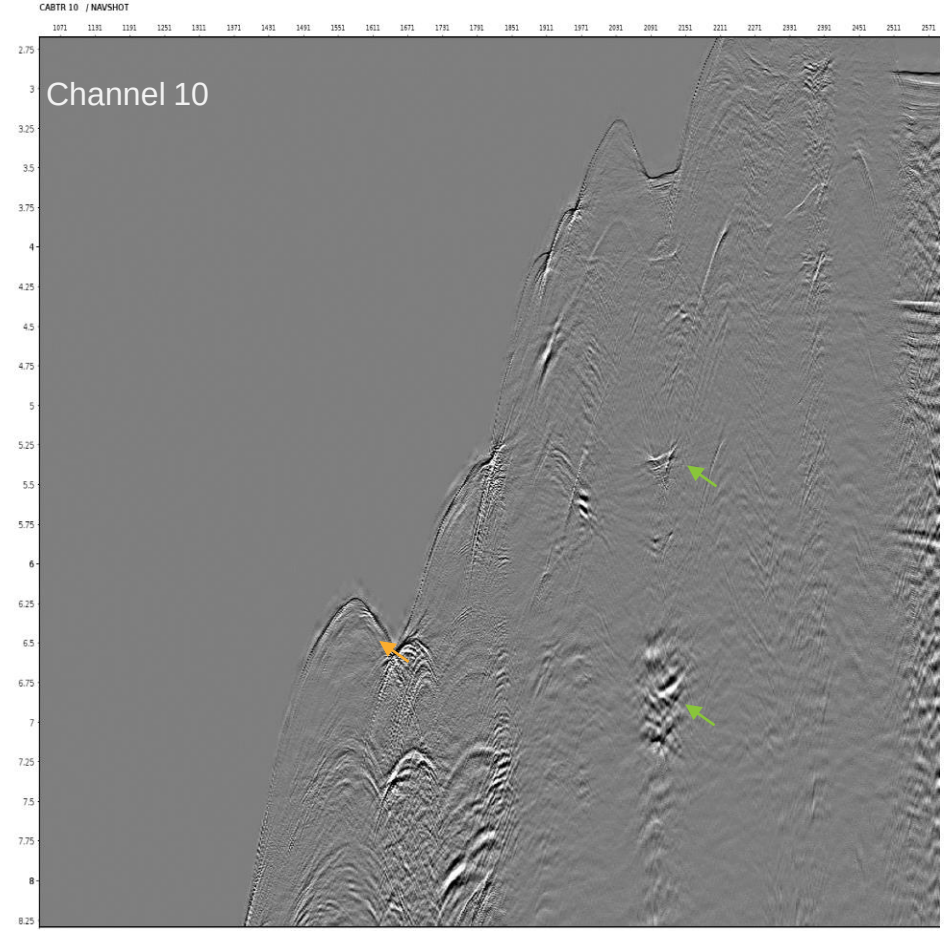
Common Channel after SRME & MWD Subtraction

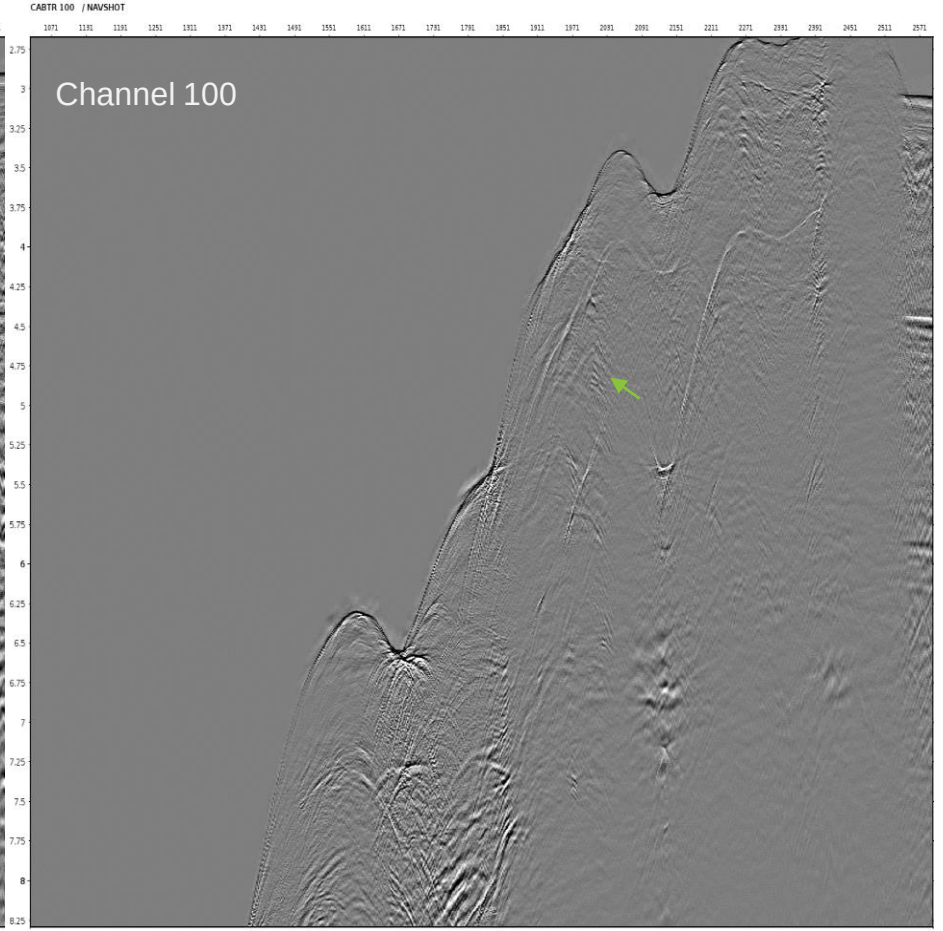




© 2020 CGG

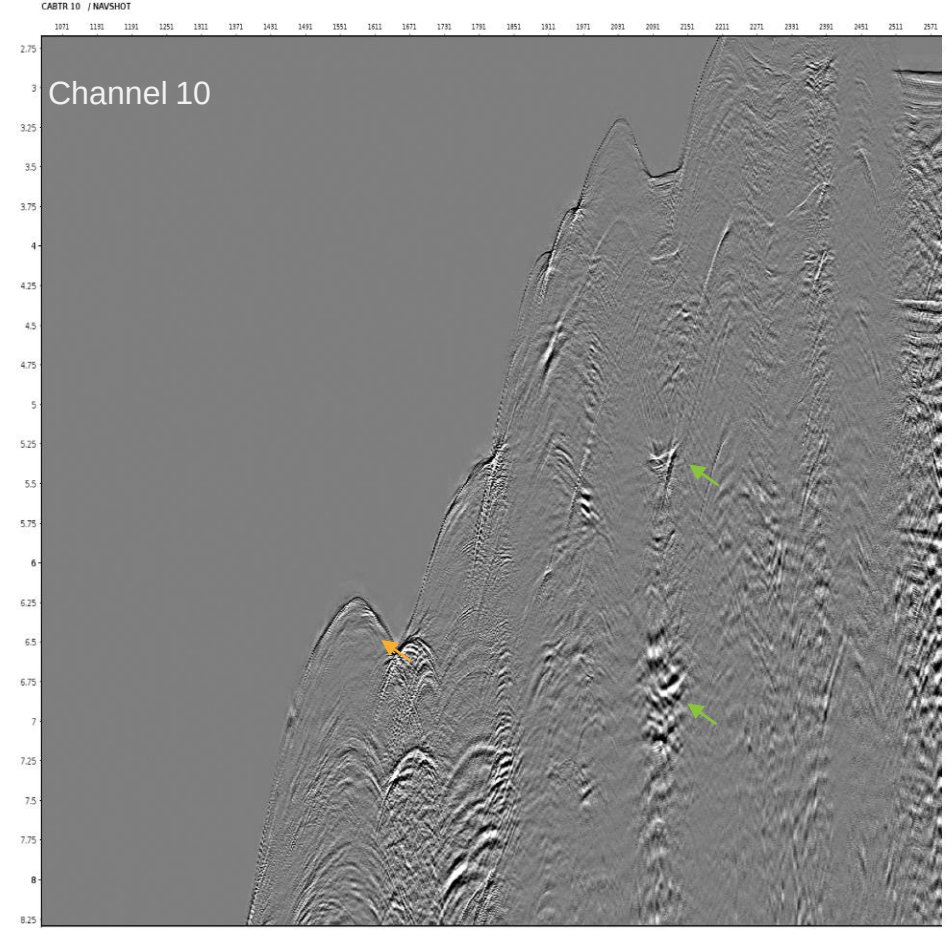
Difference before – after SRME Subtraction

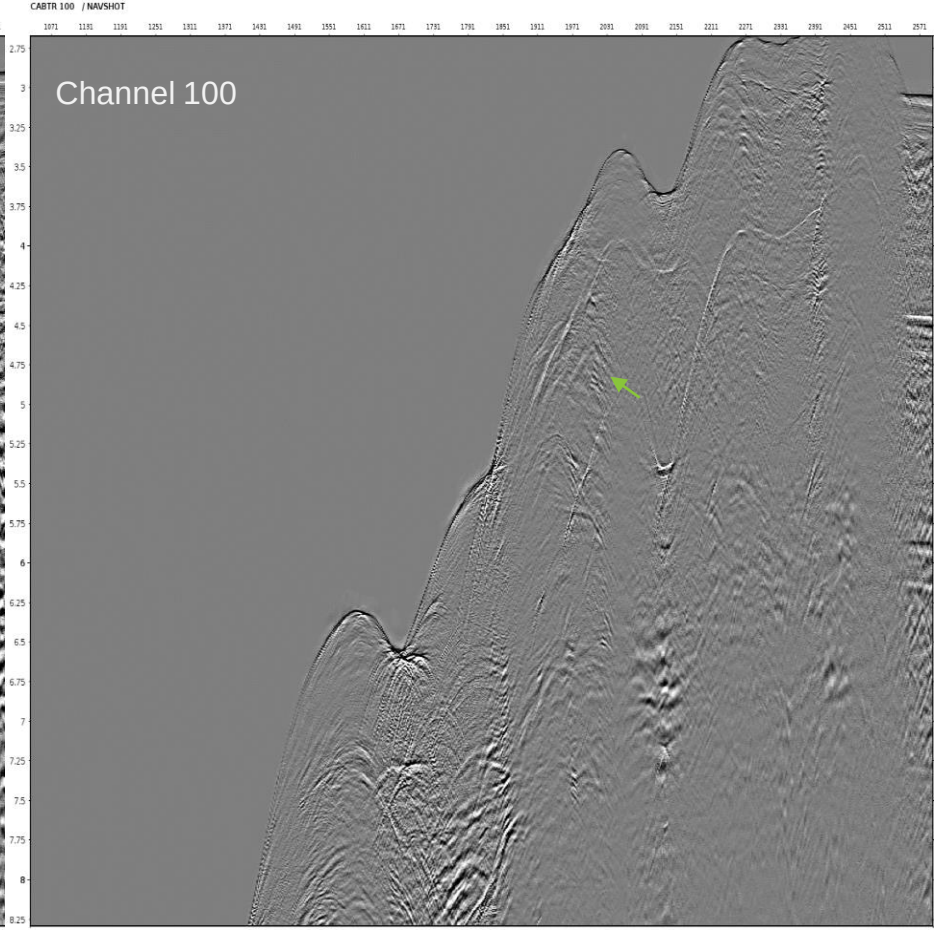




© 2020 CGG

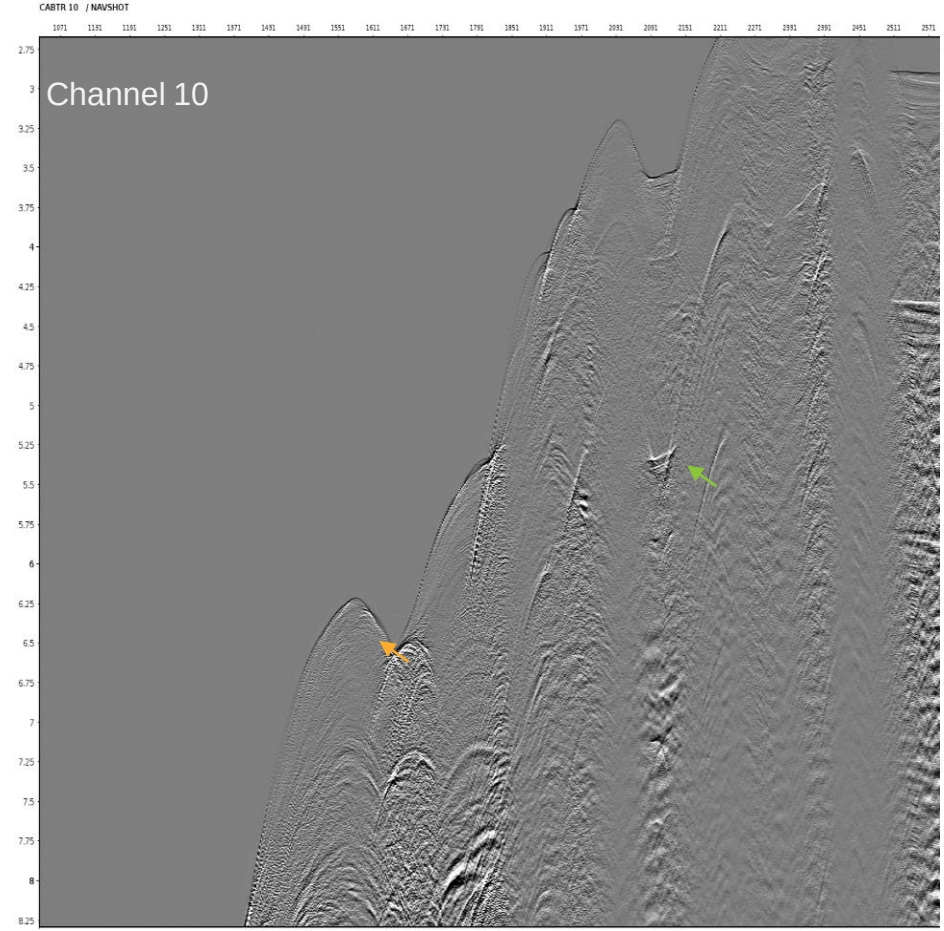
Difference before – after SRME & MWD Subtraction

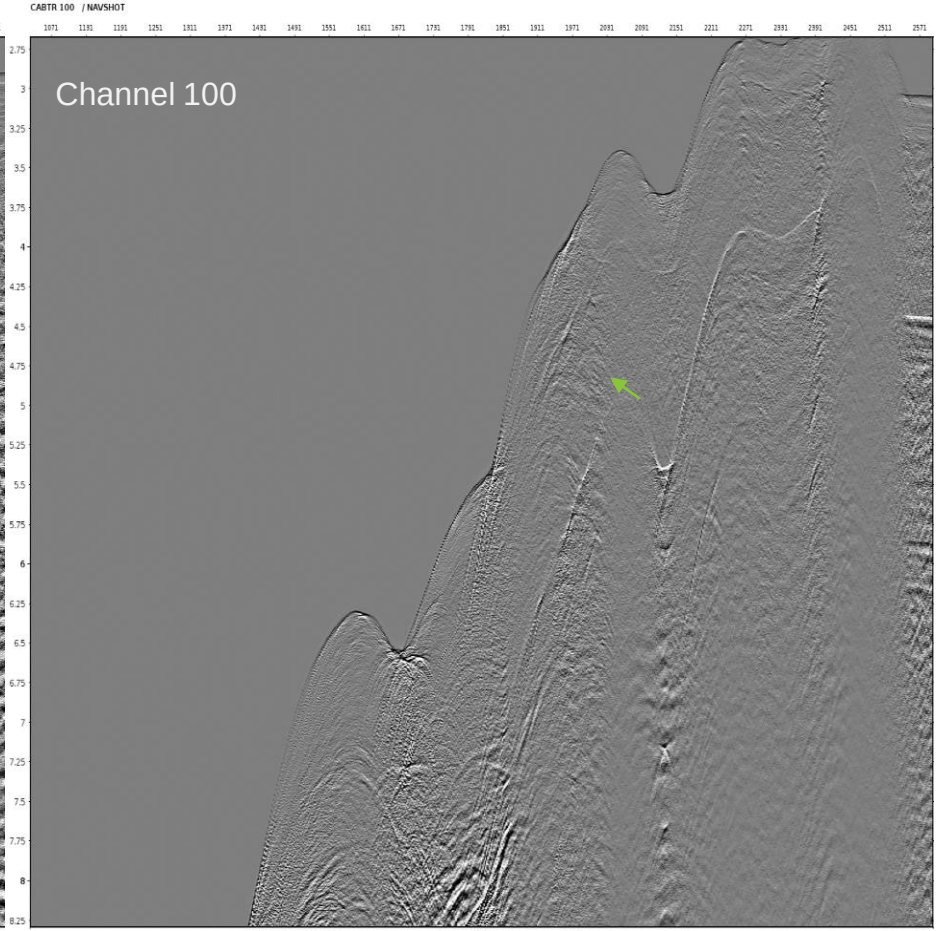




© 2020 CGG

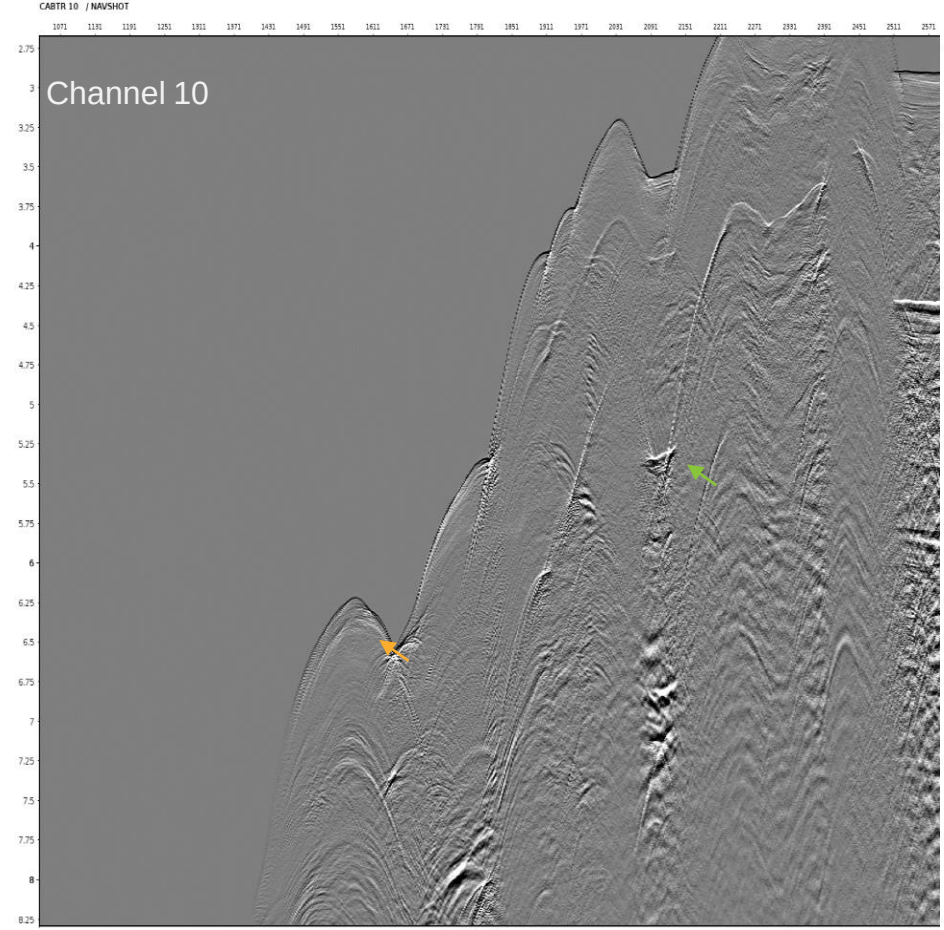
Common Channel SRME Model

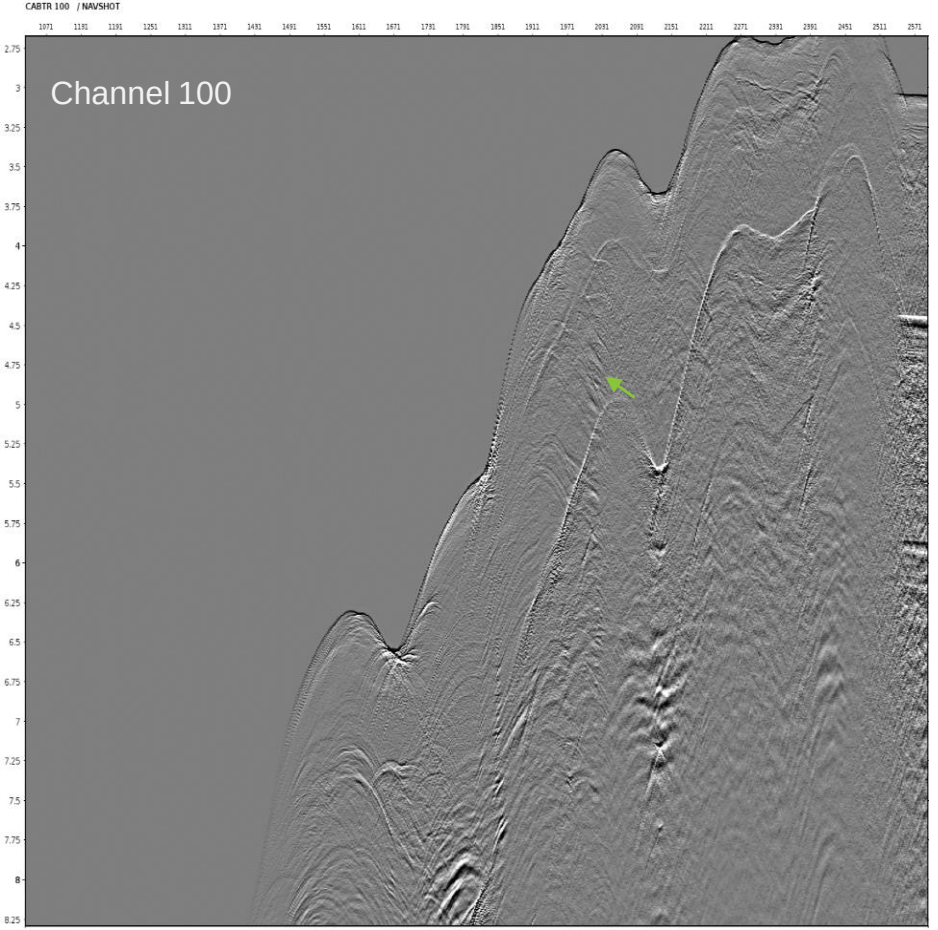




© 2020 CGG

Common Channel MWD Model





© 2020 CGG

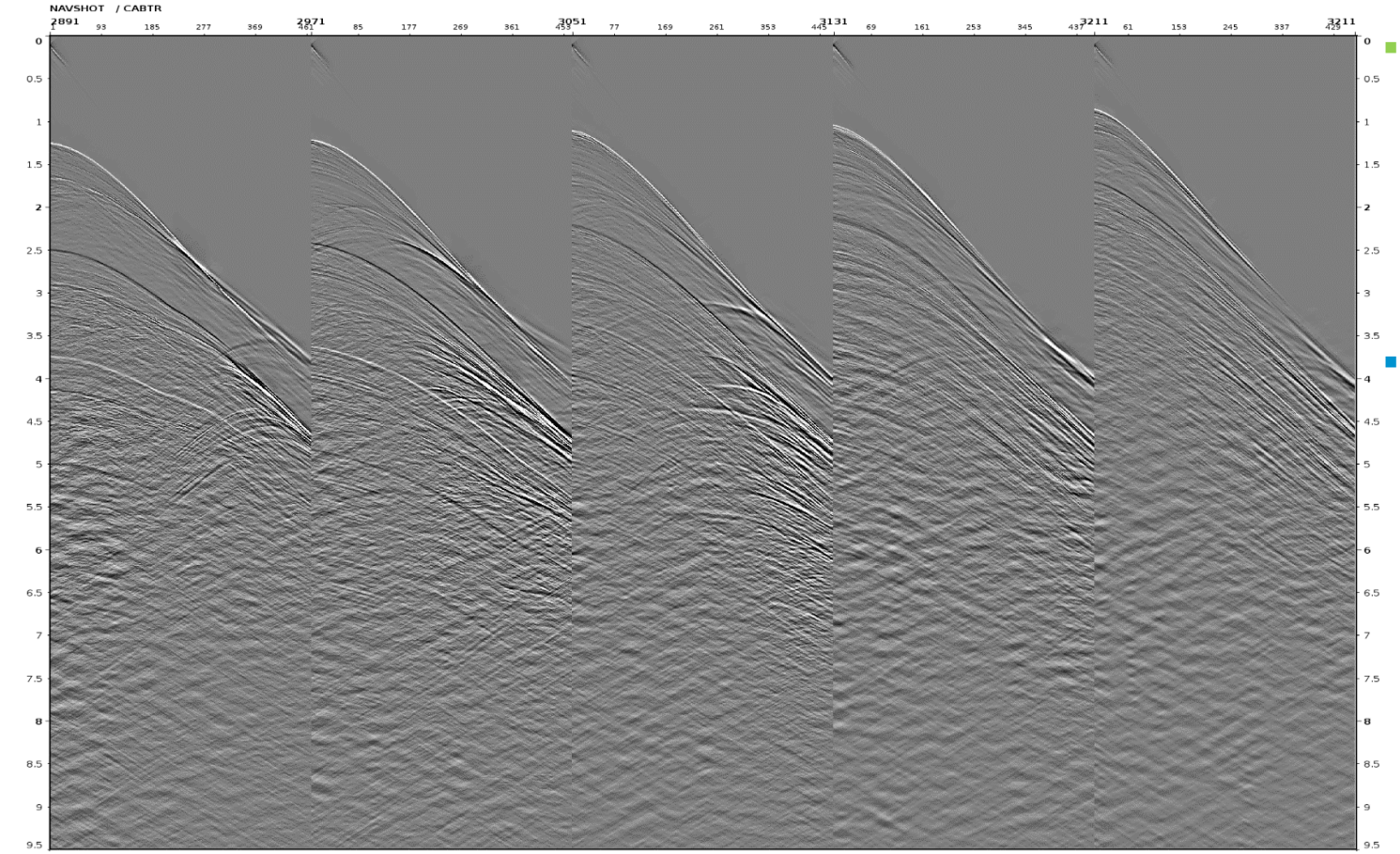
Seq 018

Stack

Common Channel

Shot Gathers

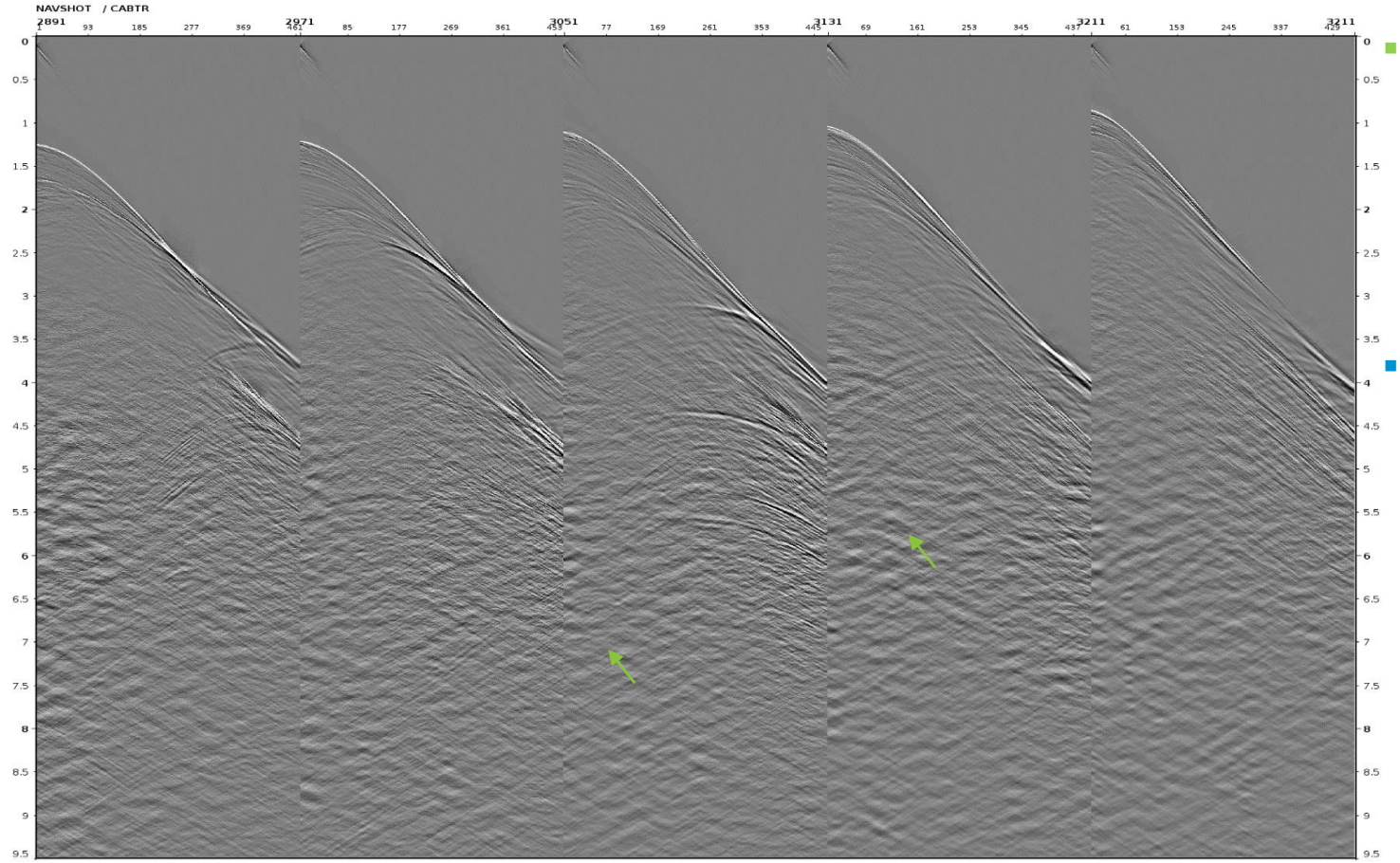
Selected Shots before Subtraction



- Simultaneous subtraction flow with MWD & SRME shows benefits in surface related multiples removal and primaries protection.
- Far offset dipping residual will be further removed by “Radon” and residual LNA (Linear noise attenuation).

© 2020 CGG

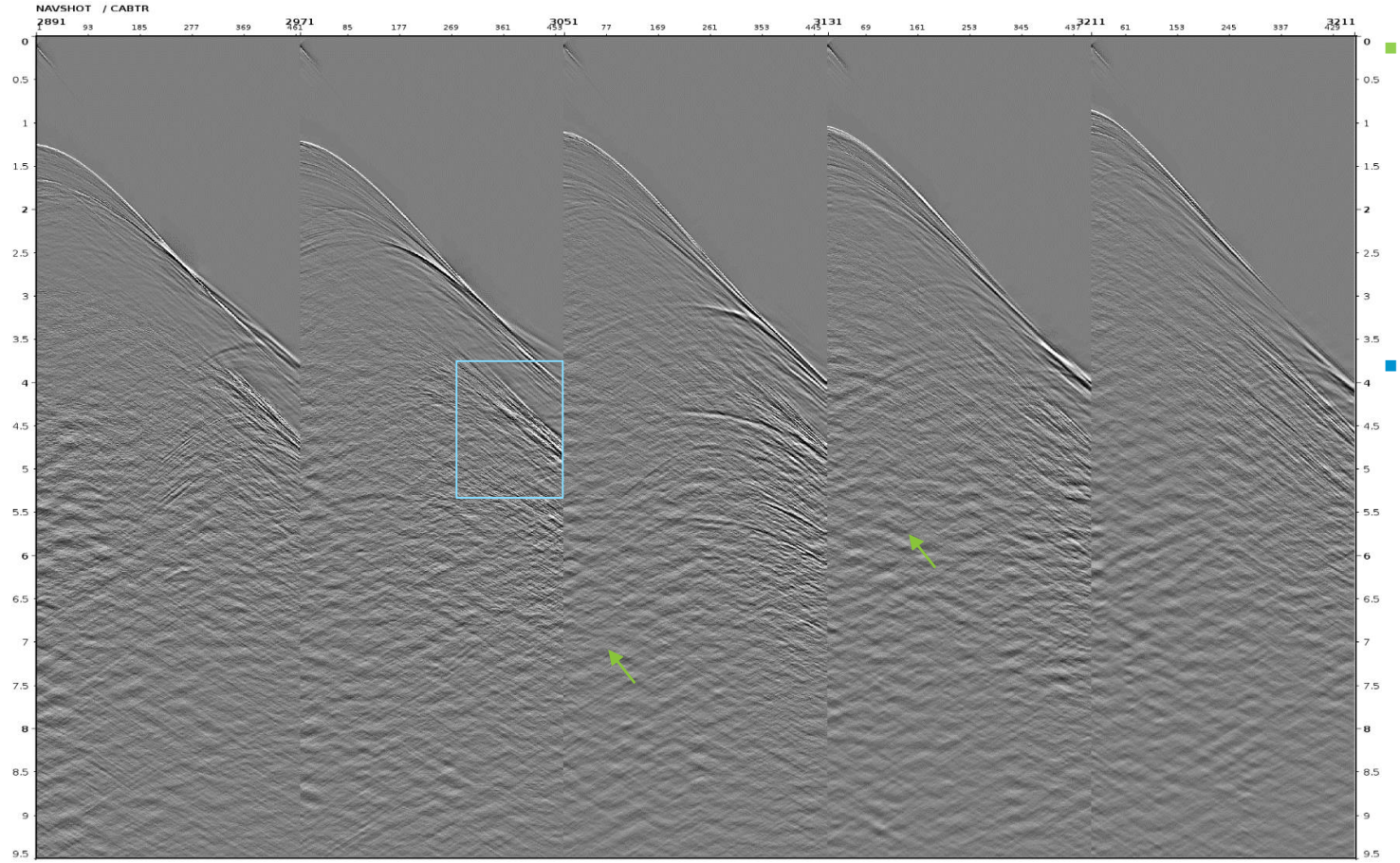
Selected Shots after SRME Subtraction



- Simultaneous subtraction flow with MWD & SRME shows benefits in surface related multiples removal and primaries protection.
- Far offset dipping residual will be further removed by “Radon” and residual LNA (Linear noise attenuation).

© 2020 CGG

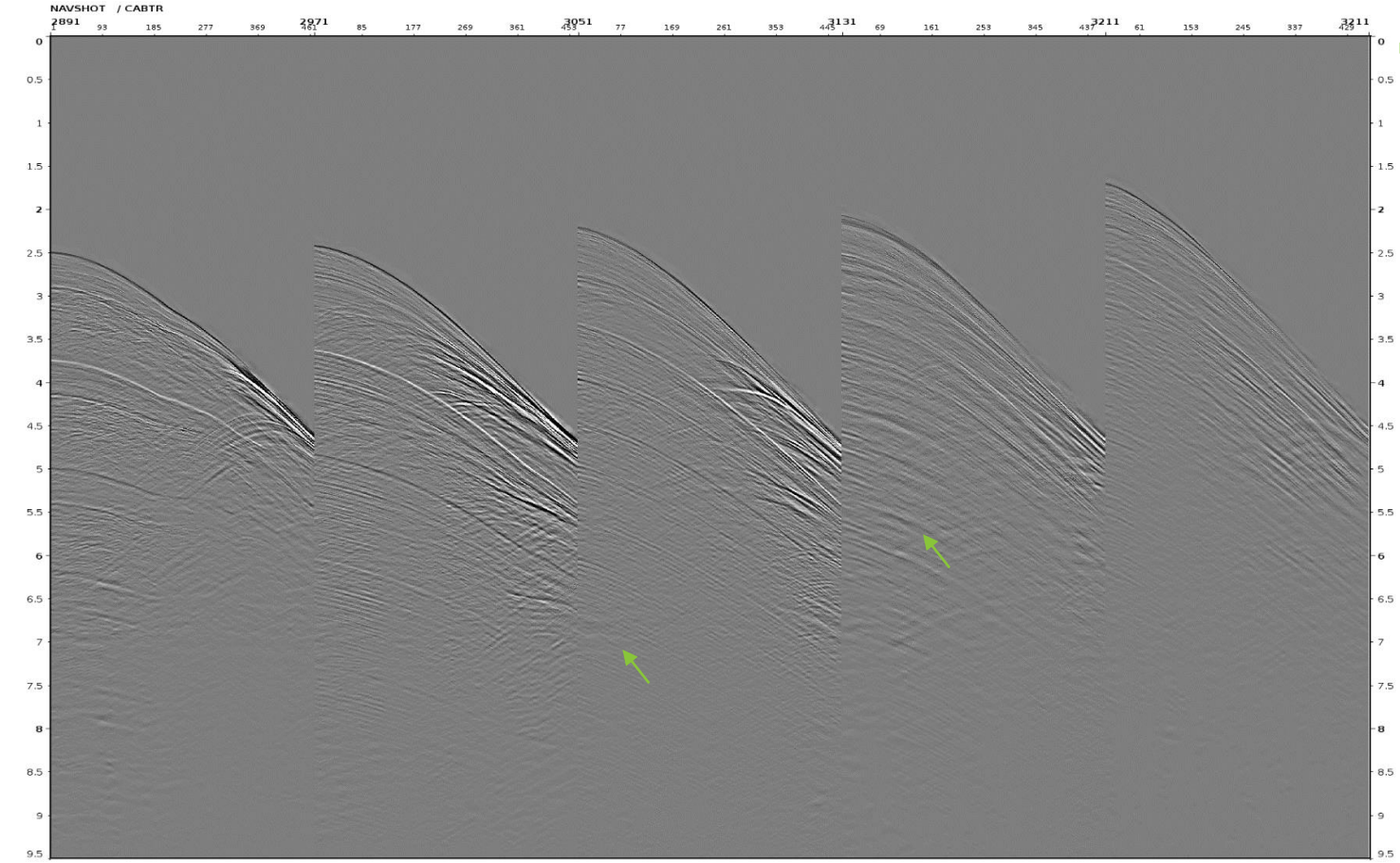
Selected Shots after SRME & MWD Subtraction



- Simultaneous subtraction flow with MWD & SRME shows benefits in surface related multiples removal and primaries protection.
- Far offset dipping residual will be further removed by “Radon” and residual LNA (Linear noise attenuation).

© 2020 CGG

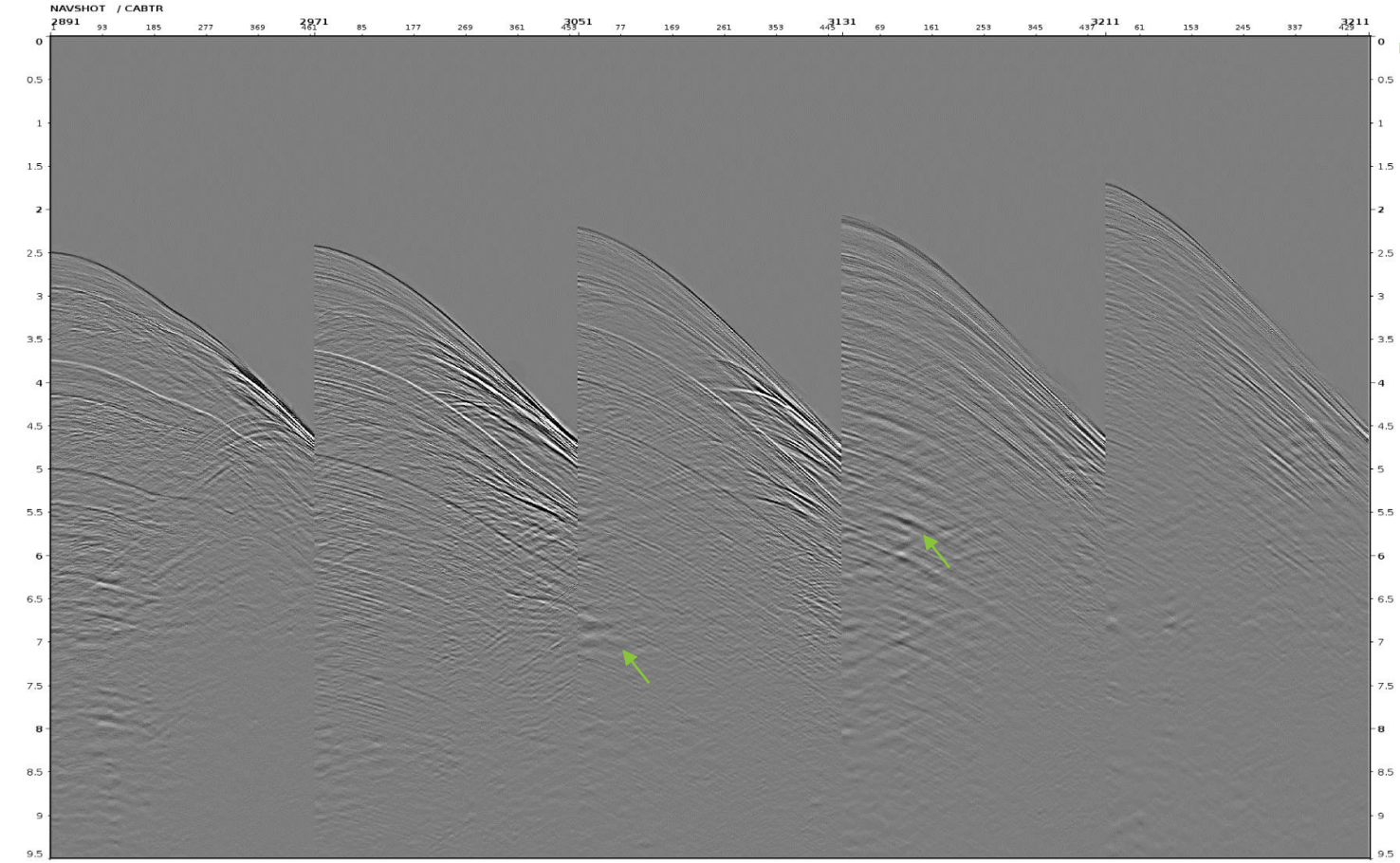
Difference before - after SRME Subtraction



- Simultaneous subtraction flow with MWD & SRME shows benefits in surface related multiples removal and primaries protection.

© 2020 CGG

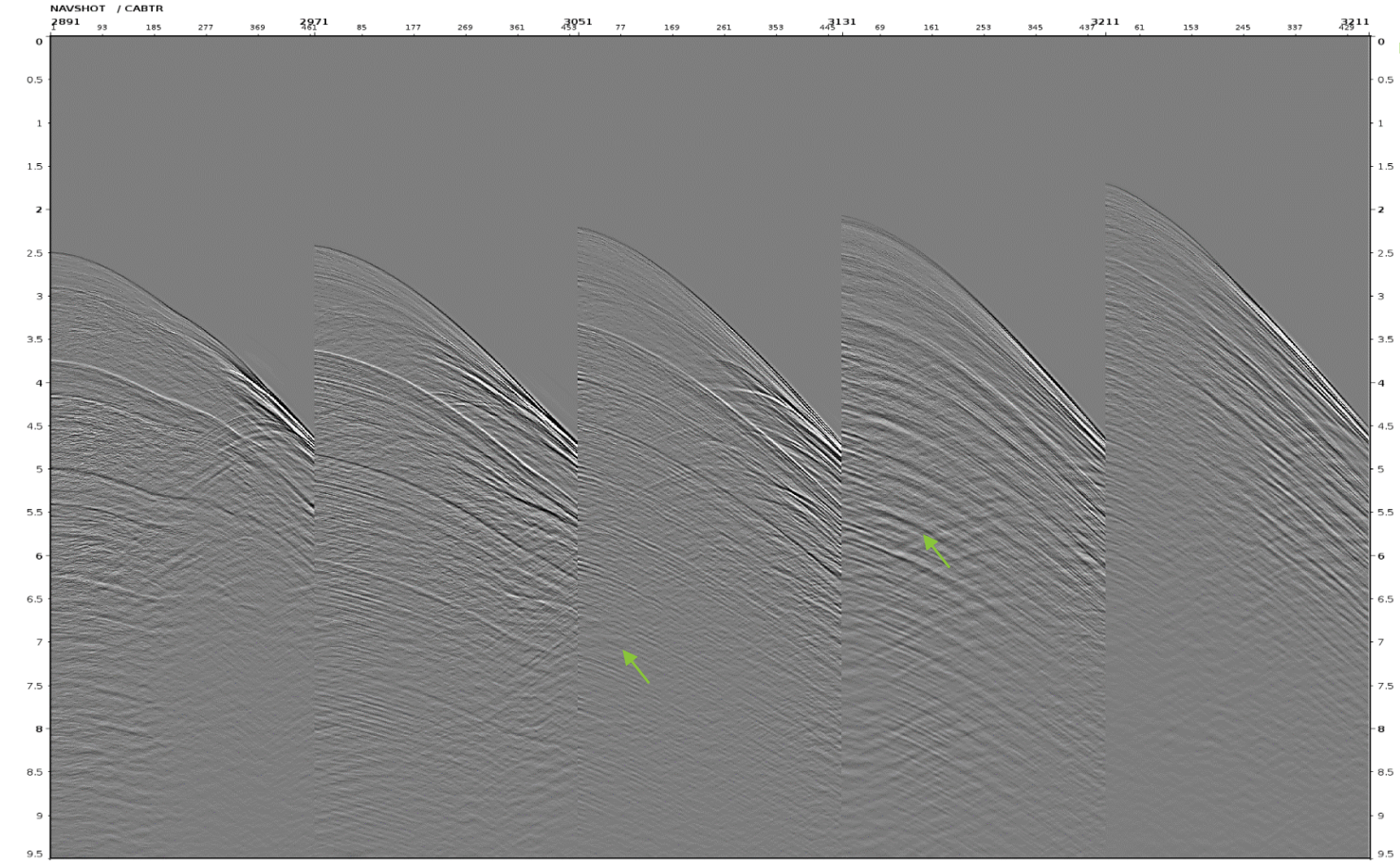
Difference before - after SRME & MWD Subtraction



- Simultaneous subtraction flow with MWD & SRME shows benefits in surface related multiples removal and primaries protection.

© 2020 CGG

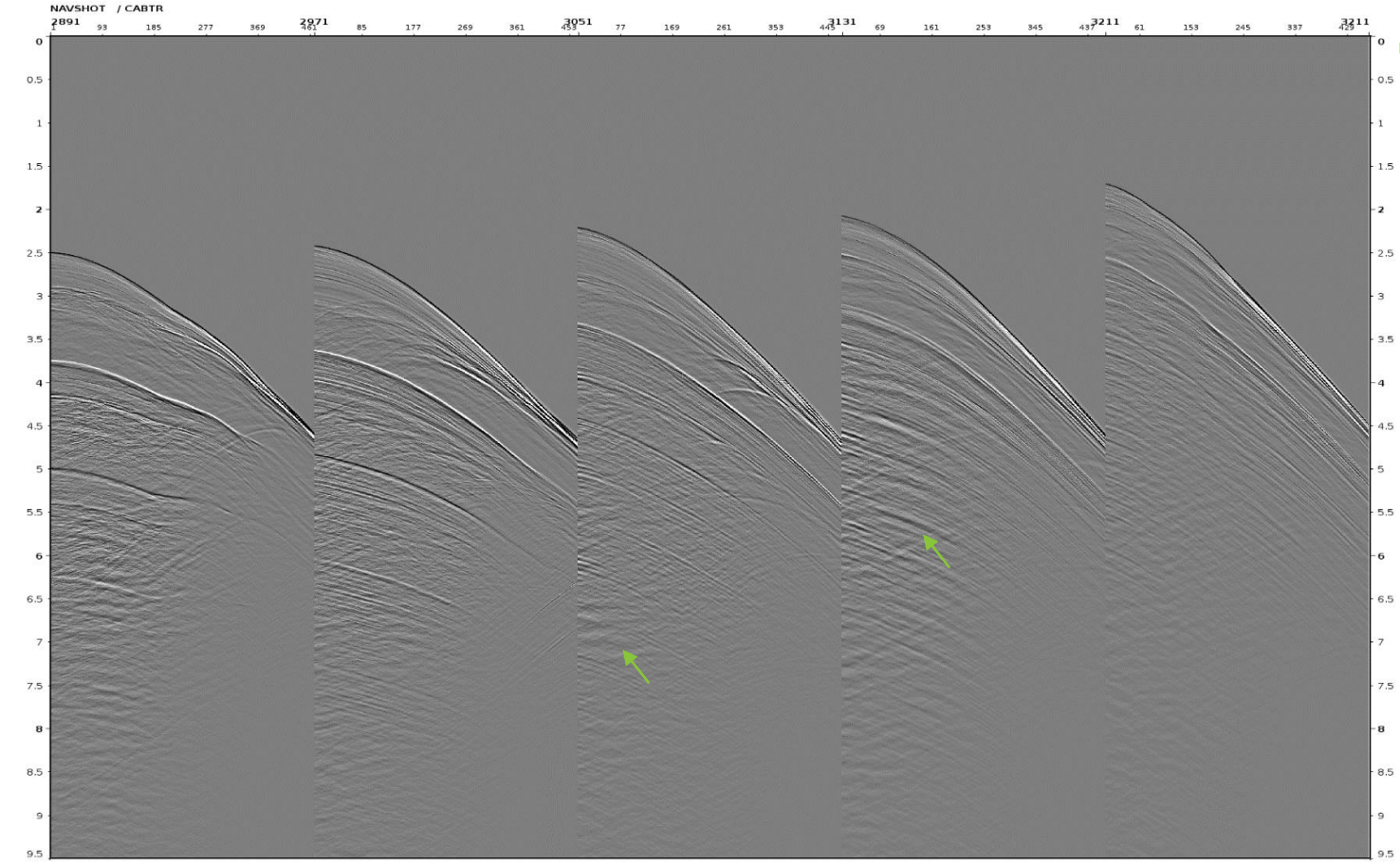
Selected Shots SRME Model



- Simultaneous subtraction flow with MWD & SRME shows benefits in surface related multiples removal and primaries protection.

© 2020 CGG

Selected Shots MWD Model



- Simultaneous subtraction flow with MWD & SRME shows benefits in surface related multiples removal and primaries protection.

© 2020 CGG

Summery

- Simultaneous subtraction is beneficial for multiple removal and primary protection. It’s recommended to apply for production.

© 2020 CGG